EE NEWS
Environmental Education in Wisconsin
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LOOK UP! THE SKY IS YOUR'S

Why the Sky?

by Dr. Owen Thompson

In choosing the atmosphere as a base for learning, we are first of all embracing the awesome sky. The sky is a stimulus for creative thought and inquiry. It is a natural laboratory open to every student and teacher, regardless of age, location, or economic status. All of us are bottom dwellers in this laboratory—benthic creatures in this sea of air. The atmosphere begins at our feet and engulfs us. It yields a legacy of history, religion, literature, art, music, romance, feats of daring, political strife. It also yields a rich legacy for unified science, math, and technology education from the elementary level to the post graduate level. It is ageless. A child may use it. A professor of meteorology may use it. It is endlessly durable and in constant refurbishment. It will be there for next year's children.

In making the sky a window for education, we call into play for each student, the first act of disciplined scientific inquiry: observation. Our first involuntary act as human beings is to sense the sky with our lungs. We continue breathing it 16 times per minute, until the end. Through our eyes, we observe it. With simple instruments, we can move our pupils from observation to measurement, meeting the concepts of precision and accuracy along the way. From measurements we may move to analysis, to pattern, to structure in time and space. From structure we may pass to hypothesis, to theory. The ways of knowing may be provoked in a child's contemplation of the sky.

A teacher's information base for studying the sky is enormous, easily accessible, adaptable to all levels of teaching and learning, and mostly free of significant cost. The release of a small helium balloon can reveal the wind to a kindergarten child. The daily newspaper will yield depictions of winds over a state, region or the entire nation. The television broadcast meteorologist can show our child patterns in the winds and relate them to storminess and instability, or to centers of stable quiescence. The photographers of planets can give our pupil an awesome, global view of the natural scientific drama in which his single balloon performs. Art galleries and museums, magazines and music, can add life to the subject.

The atmosphere encompasses all sizes and time scales. A child can discover science in a single raindrop in her hand, or behold them in a rainbow, or wonder of them in the clouds, or watch them from space, encircling the globe as weather. The sky adapts to a teacher's uncertain schedule. It performs its experiments in as little as a second with a lightning stroke, in minutes with its ever-changing clouds, in hours with its thunderstorms, in days with its hurricanes, cyclones and evolving weather patterns, in weeks with its seasonal march. It willingly adapts to the time available for contemplation.

An appreciation of the coherence of its seemingly chaotic and disjointed parts carries with it a message about life itself. The sky can provide our children with a holistic educational experience—a window on science and humanistic endeavor. A teacher can treat the sunset as an experiment in the optical scattering of light, or as contemplative preparation for a painting. If as a painting, the choosing of colors can be used to provoke scientific inquiry as to how the sky itself chooses them. The sky embraces art and science and helps provide a bridge between them.

With sights and sounds, the sky pleases us. It sometimes frightens us. It calls upon us to make our peace with it and to understand it. The atmosphere has been nurtured and abused. Acid rain and "nuclear winter" challenge each of us to consider the influence of science on society. The sky serves as a unifying element around which almost every intellectual discipline has its views. The familiar and beautiful rainbow, for example, has has spawned a marvelously diverse set of views through the windows of mythology, religion, art, and commerce as well as physics, mathematics and meteorology. The sky challenges us to integrative thinking. To a holistic approach to giving our children an education in the reality of science and life.

—From "Look Up! The Sky is Yours," in *For Spacious Skies: A Teacher's Guide*, 1988. Reprinted with permission.

PLEASE NOTE:

Our mailing list will be updated on October 20. **If you would like to continue receiving *EE News*, please see page 23.**

About our next issues...

As you know, *EE News* editor, Anne Hallowell is off to Minnesota. Anne has done a terrific job with *EE News* over the last six years. Her commitment to teaching about the environment has made the newsletter what it is today. Thanks, Anne. We'll miss you!

We expect to fill the editor position sometime this winter. Since that leaves us with several editor-less editions of *EE News*, we had to do some planning for the interim. Two new education institutions offered to help out: the winter issue will be brought to you by the newly established Center for Environmental Education at UW-Stevens Point. And the Center for Biology Education at UW-Madison will produce the spring issue. We're sure these issues will be loaded with exciting information. (Articles and resource/calendar information, etc. should still be submitted to: Editor, EE News, DNR Bureau of Information and Education, P.O. Box 7921, Madison, WI 53707.)

In this issue, produced by the DNR Bureau of Information and Education, we focus on the air, water, wind, clouds, sun, moon, planet and stars, which we collectively call "sky." We hope that this issue will inspire you to help your students look up and appreciate this immense and diverse resource.

—Jo Temte, Interim Editor

Moonstruck

by Jerry Dennis

The moon is full tonight, swollen and bright and bleating with strangeness. I know it is because the calendar says so; the moon itself is hidden behind a dense mantle of clouds. If I were receptive enough, perhaps I could sense the phases of the moon in my blood. I might feel gravity pulling at the salt water in my veins the way it pulls at salt water in Canada's Bay of Fundy. I might grow unaccountably restless, pace the floor, howl, dance, fall in love.

Living indoors, muffled by so many generations of reason and civilization, most of us have grown immune to much of the moon's magic. Otherwise, we might indeed suffer bouts of lunacy brought on by sleeping in the open beneath a full moon—*moonstruck* in the original sense of the word—or find sense in tales of lycanthropy and bewitchment. The moon has been blamed for everything from bad moods to traffic accidents to earthquakes; but whenever someone proposes a theory to explain how that might be so, someone else steps forward to demonstrate why it does not stand up to skeptical inquiry.

Still, romantics and skeptics agree that the moon is a potent force in the lives of many of Earth's creatures. Aristotle observed that the ovaries of sea urchins swell during the full moon. More recently, it was discovered that, under laboratory conditions, some shore organisms continue rhythmic activities that coincide with the cycles of the tides. For example, the tiny flatworm, *Convoluta roscoffensis*—described so eloquently by Rachel Carson in *The Sea Around Us*—continues to burrow into the sand during high tide and climb to the surface at low tide even when in an aquarium. Oysters taken from Long Island Sound and shipped to a lab 1,000 miles away in Evanston, Illinois, maintained a cycle of valve openings and closings that at first corresponded to the tidal rhythms of their home water. Gradually, however, those rhythms adjusted to coincide with the lunar gravitational pull in Evanston.

In *The Descent of Man*, Darwin observed: "Man is subject, like other mam-

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The Editor invites articles, news items, resource suggestions, and letters to the editor for possible publication. Deadlines for submission are:

Spring issue—December 10
Summer issue—March 10
Autumn issue—June 10
Winter issue—September 10

Send to: Editor, *EE News*, DNR Bureau of Information and Education, P.O. Box 7921, Madison, WI 53707, 608-267-5239.

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Jeanne Gomoll, Graphic Artist

mals, birds, and even insects, to that mysterious law, which causes certain normal processes, such as gestation, as well as the maturation and duration of various diseases, to follow lunar periods.

A 1959 study by Drs. Walter and Abraham Menaker found the average human menstrual cycle to be 29.5 days—precisely the length of the lunar month. The same study, based on 250,000 births—found the average length of human gestation to be 265.8 days—almost precisely nine lunar months—leading the Menakers to believe that the human reproductive system follows lunar not solar time. Most researchers today remain cautious about accepting that conclusion. The frequent claims of police officers and hospital workers that the incidence of violent crimes and accidents increases at the full and new moons have never been adequately substantiated. Studies of homicide records over several decades in various U.S. cities convinced Arnold Lieber and a few other psychologists in the 1970s that there was a statistical basis for such beliefs, leading Lieber to hypothesize that "biological tides" influence movements of salt, water, and hormones in the brain, resulting in bizarre behavior. Later studies, however, using larger data bases, failed to find any statistical evidence that the number of violent crimes varied with lunar cycles.

In spite of the controversy and the lack of definitive data, it seems likely that all life on Earth is influenced at least to some degree by the moon. According to one current theory, the moon at early stages in its history followed an orbit much closer to Earth than it does today. Earth's oceans would have experienced tides far higher and more powerful than those we know, sweeping the shores like a beater in a vat, stirring chemicals into combinations that lead to the first forms of life. Organisms evolving under those tidal influences would have been subjected for hundreds of millions of years to the ebb and flow of massive tides. If we, and most other forms of life on earth, evolved from those creatures, it is conceivable, as Darwin believed, that some of our biological processes would still be influenced by the moon-induced rhythms of the sea.

If, as a number of scientists predict, air pollution and the greenhouse effect turn up the Earth's thermostat by 2 to 9° F by the year 2050, thereby raising the sea levels through glacial melting, we may see our own era of unprecedented tidal action. The results of human-induced climate change may profoundly affect life as we know it.

Whether our reactions to that old devil moon are innate or learned, our planet's natural satellite still moves us. Even in these post-Apollo years—with human footprints etched as permanently as pictographs on the lunar surface—we can still be awed and mystified by the sight of a rising moon. That fact suggests the moon's power goes deeper than the sentiments of flowery songs such as "Blue Moon" and "Moon River."

Modern wolf researchers have pretty much killed the myth of wolves howling lustily at the moon, but the fact remains that predators and prey alike are made restless and edgy by the pale light of the moon. Not so long ago in the global scale of time, men, women, and children were prey as well as predators and would have learned that nights of full moon were times to be restless and on guard. When people were living among tigers with 10-inch canines and cave-dwelling bears that would make Kodiaks look like koalas, the moon must have represented far more than a mysterious object traced with odd, face-like images.

A person probably has to be as sensitive as a seismograph to register the full range of lunar influences, and I'm afraid I'm constructed of too course material. One night last summer, with the full moon near its zenith and the woods settled into the rich, buzzing alertness of deep night, I walked a ridge of maples above the river near my house. I was aware of no primitive urgings, did not feel the obstinate swell of the tide in my veins, was in fact thinking of home and a cold beverage and bed, when something compact and terribly fast exploded from a dark clump of underbrush at my feet, then crashed away through the bushes with all the delicacy of a flung bowling ball. My primal memory, I suspect, has lapsed—I saw no images of rushing wings or clenching talons, no claws or saber teeth—but it was interesting to note how well my fear reflex works. Aided by moonglow or not, that rabbit scared the living daylights out of me.

—From *Wildlife Conservation* magazine, May-June 1991, New York Zoological Park, Bronx, New York 10460. Reprinted with permission.

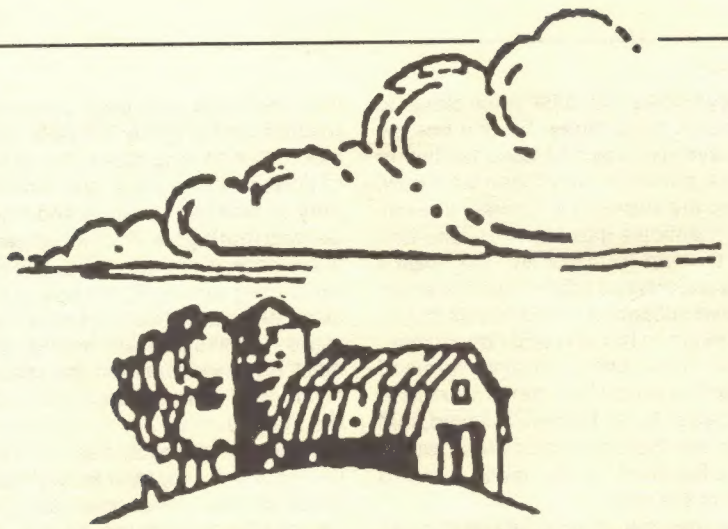
A Dose Of Sunlight?

Most of us get at least a touch of the "winter blues," but for approximately 5% of the population in the middle to northern latitudes of the United States, winter is a time of severe depression. An estimated four to five million people in northern climes suffer from Seasonal Affective Disorder (SAD).

SAD is cyclical, recurring and persistent depression that begins in October or November and subsides in March or April. Symptoms can include anxiety, irritability, social withdrawal, motor retardation, carbohydrate cravings, excessive sleepiness and feelings of worthlessness, guilt and self-reproach.

The prescription for SAD? Light. Research has shown that exposure to bright light (phototherapy) alleviates the symptoms. The treatment for SAD sufferers is daily exposure, at dawn or dusk, to bright light. Manufacturers now offer a variety of lamp types. What appears to be critical is that the lamp's light match the level of light outdoors shortly after sunrise or before sunset.

—Information from: "The Blackest Winter Blues," in *Psychology Today*, January-February 1989, and "Shedding Light On Seasonal Affective Disorder" in *Mpls. St. Paul Magazine*, January 1989. For more information, see: *Season's of the Mind* by Norman E. Rosenthal, M.D, 1989, Bantam Books, 666 Fifth Ave., New York, NY 10103.



Have You Seen the Sky Today?

Sky Awareness is Goal of "For Spacious Skies"

Can you describe the sky today without looking out a window? If not, you're not alone. Most of us take this enormous resource for granted. Jack Bordon, former news reporter for WBZ-TV in Boston would like to change that.

Bordon discovered our "sky illiteracy" while conducting sidewalk interviews on a sunny day in June 1977. The interview was simple; Bordon would approach a person on the sidewalk, then cover their eyes and ask them what the sky looked like. To his astonishment, not a single person could describe the sky.

Seeing the sky as more than the sum of its parts is not something we do very often, says Borden. We study astronomy, meteorology, aviation and astrology. Psychologically, our moods are sunny or gray, depending on the weather. Our activities are circumscribed by rain or shine; our lives are governed by the alternating light and darkness we call day and night. But, like people who cannot see the forest for the trees, we are oblivious to the sky as an entity unto itself.

"The true journey of discovery consists not in the pursuit of new landscapes, but in having new eyes."

—Marcel Proust

Bordon's initial interest in the sky was spurred when he realized his own "sky-blindness." One sunny afternoon, he and his wife were walking around Wachusett Meadow Audubon Sanctuary in Massachusetts. He lay down on the grass and found himself gazing into bright blue sky dotted with puffy clouds. Overwhelmed by its quiet beauty and grandeur, he realized that in all his life, he had never really seen the sky.

It was because of this revelation that Bordon—along with Bruce McHenry, retired Chief of Interpretation for the National Park Service, and Charles Roth, Chief Educator/Naturalist for the Massachusetts Audubon Society—founded *For Spacious Skies*, a non-profit educational organization to foster awareness of the beauty and wonder of the sky.

Educational efforts are focused mainly on school children. (Since its inception in 1981, *For Spacious Skies* has been incorporated into curricula in the U.S., Canada, and over 20 other countries.) An elementary level teacher's guide is designed to engage kids in activities that require attention to the sky: keeping a daily journal, sketching the sky, articulating what feelings the sky generates and even setting a watch alarm as a reminder to look up. Students are introduced to sky-related equipment, such as binoculars, thermometers and compasses. Classes also have the opportunity to study the night sky, or to investigate the influence of the sky in popular and classical music. In addition, special instructions are included for setting up a classroom weather station.

—Compiled from: "Discovering the Sky," in *Sanctuary, The Bulletin of the Massachusetts Audubon Society*, September 1988, and "For Spacious Skies," in *The Amicus Journal*, Spring 1983.

Sky Awareness Activity

Objectives: To create awareness and excitement about the sky. To learn not just to look, but to "see."

Introduction: Tell students they are going to do an experiment. Each will need a pencil (or a crayon) and three pieces of paper. Take the class to a place in the school where it is quiet and there are no windows.

Now ask the students to close their eyes and picture themselves back at home, just walking out the door on their way to school. Have them picture how they came to school—by car, bus or walking. What did they see on their way to school? Did they see the usual or anything unusual? Then have them open their eyes. For kindergarten and first grade, ask the students to draw something they saw. Second graders can draw two or three things they remember seeing. Third graders and up can write descriptions of what they saw. Have a number of students share these aloud.

After sharing, ask if anyone drew or described the sky. Ask the class to raise their hands if they saw the sky this morning. They will all probably volunteer a hand. Then ask them to draw or describe on a fresh sheet of paper what the sky looked like. What color was it? If it was blue or grey, what shade of blue or grey? Were there clouds? Were the clouds moving? What shape were they? Were there any other things in the sky?

The students will begin to realize that they didn't really observe the sky carefully. It is then that you should take them outdoors to look at the sky. Once outside, start by showing students how to observe. Note colors, shades, cloud formations, objects and movements of the sky. Ask them to observe the atmosphere or lower sky—this is the air envelope that surrounds us.

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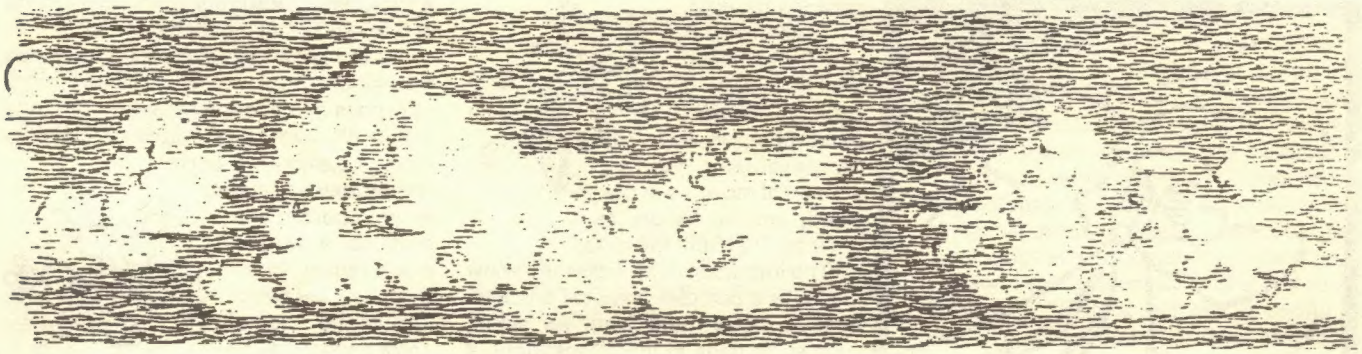

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Go back to the classroom and have students write "before" over their first descriptions of the sky. Then ask them to write their new descriptions and label them "after." Begin a group discussion by asking volunteers to share their drawings or statements. Remind the students that the sky is really an ocean of air. If we lift one of our feet, there's a piece of sky under it!

Extension Activities:

1. Sky Journal (all grades): Announce to the class that drawings or statements from the introduction activity will be the first pages of their own Sky Journals. (It is a good idea for the teacher to keep a journal and to share some notations about the sky.) Sky assignments can be recorded in the journal, but it should also be a place where students feel they can write spontaneously about happenings in the sky and feelings the sky generates.

2. Sky colors (grades 1-4): Place an easel with blank paper at the back of the room or arrange drawing tablets on the chalk tray. Students can paint during free time. Over time you will notice their sky paintings go from a sweep of blue across the top of the page and a circle of sun to more sophisticated gradations of sky color and cloud representations.

3. Sky palette (grades 3-6): get a color-chip brochure from a paint store with every gradation from white to grey to blue and purple. Include the reds and yellows of sunset and sunrise. Ask students to name each color, such as burning orange and quiet blue. Put the chips and their color names on a large poster. This may be used each day for a sky check and may trigger some expressive language arts activities.

4. Weathercaster (grades 3-8): Have students present an actual weather report using a sky/weather chart as a guide. They may set up a mock TV weathercaster's station.

5. Mythology (grades 5-8): Ask students to create their own myths about the sky: how clouds form, why the moon shines, why there are thunderstorms, etc. These make for interesting comparisons with actual scientific facts about the subjects. Read myths about the sky from other cultures. Discuss myth versus science.

—from *For Spacious Skies: A Teacher's Guide*. 1988.

For Spacious Skies Resources Available

The following materials can be ordered from: For Spacious Skies, Dept. WS, P.O. Box 191, Lexington, MA 02173, 617-862-4289:

For Spacious Skies: A Teacher's Guide. This guide contains a program overview, eight activities for teaching general sky awareness, use of instruments such as binoculars, compass, and thermometer, star gazing, and sky songs. Appendices include wind-barometer, relative humidity, and wind chill tables, as well as suggestions for further reading. Cost: $7.50, postage paid. Teacher's guide and one cloud chart set (see below), $13.50; guide and two cloud chart sets, $18.50.

Cloud Charts. An 11½" by 16½" laminated chart contains 26 color photos of cloud types. Also included is a laminated guide to interpreting cloud types. Cost: $6.00, postage paid.

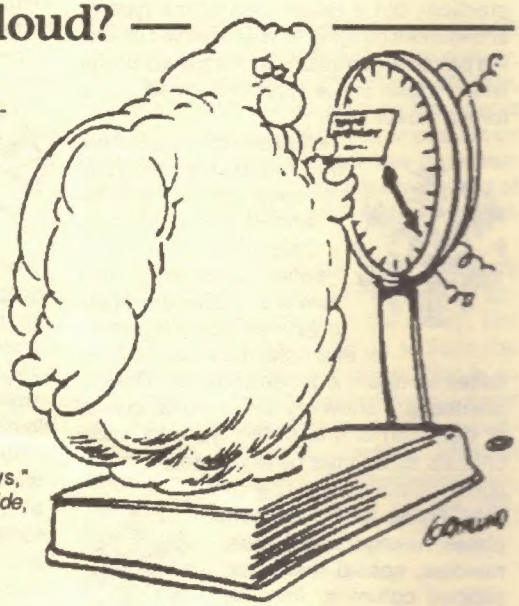
The Weather Report. Mike Graf. A teacher's guide to weather study for grades 4 and up. Topics include clouds and fog, precipitation, wind, air pressure, geography and climate, building your own weather station and more. Cost: 13.95, postage paid.

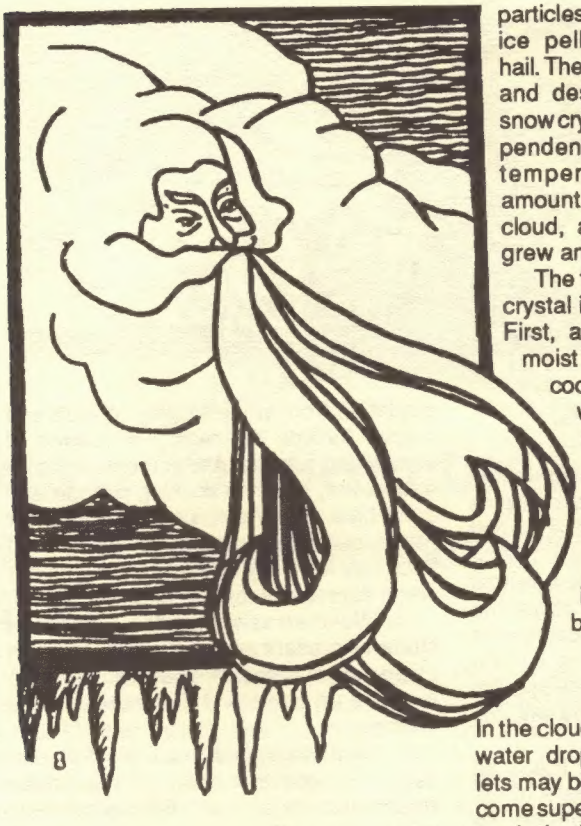
How heavy is a cloud? —

by Bruce Schwoegler, Meteorologist (and Milwaukee native), WBZ-TV, Boston

Clouds are packages of atmospheric energy buoyed up by ascending air currents. One puffy cloud contains trillions of tiny water droplets with a combined weight of a half million tons. Thunderstorms weigh several million tons, and their watery loads approximate the energy in a 10,000 foot high hydroelectric dam.

—From "Weatherwise and Otherwhys," in *For Spacious Skies: A Teacher's Guide*, 1988.





Let it Snow!

by Anita Carpenter

On a wintery day with snow gently falling, have you ever gazed skyward and wondered what is happening in those dense gray clouds to produce such intricately shaped flakes? A trip to the cloud is impractical, but a closer look at the type of snowflakes clinging to your sleeve reveals the physical conditions in the clouds under which those snow crystals formed. Let's take a closer look.

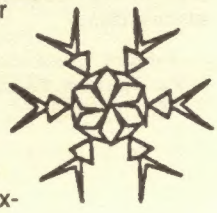
What we call snowflakes, the familiar six-pointed star shapes, should really be termed snow crystals. Scientists define a snowflake as a cluster of several individual snow crystals clinging together; for example, those large, fluffy flakes we find in a gentle snowfall. The six-pointed star snow crystal (a stellar crystal or dendrite) is one of ten types of snow crystals as defined by an international commission. The other nine types are: hexagonal plates, hexagonal columns, needles, spatial dendrites, capped columns, irregular

particles, graupel, ice pellets, and hail. The formation and design of a snow crystal is dependent upon the temperature and amount of moisture in the cloud, and its history as it grew and fell from the cloud.

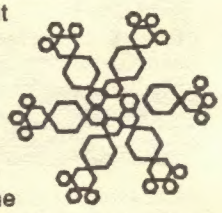
The formation of an individual snow crystal is a complex physical process. First, a cloud must form. As warm, moist air rises in the atmosphere, it cools. Cool air cannot hold as much water vapor as warm air. Therefore, at its dewpoint, the water vapor condenses onto minute dust or salt particles (called condensation nuclei) that are suspended in the air, thus forming water droplets and becoming clouds. Water droplets grow by bumping into each other and fusing or coalescing.

In the cloud, water droplets may become supercooled; that is, they remain liquid below the normal freezing point. When a water droplet encounters a much rarer freezing nucleus (such as a clay-silicate particle or a broken fragment from an already formed ice crystal), the water droplet freezes around it and becomes a minute ice crystal. As the ice crystal floats in the cloud, water vapor diffuses onto its surface and freezes in a symmetrical pattern and the ice crystal grows into a snow crystal.

Only specific shapes of snow crystals (variations of hexagons) can form because of the molecular structure of water and its formation into a defined crystalline lattice when it freezes. The type of snow crystal that is formed is determined by the temperature in the cloud. Its rate of growth is influenced by the amount of moisture available. Greater water vapor saturation causes an increased growth rate that results in large, beautiful feather snow crystals. Stellar dendrites form at a very narrow temperature range around 5°F with a high degree of water vapor saturation. Hexagonal plates form in the temperature range of 0 to -25°F, but in much drier air.



As the snow crystal grows, it becomes heavier and begins to fall. In its descent, it may pass into another region of the cloud with a different temperature or moisture level. Likewise, a snow crystal may be caught in an updraft and sent to a cooler cloud region. In either case, the structure of the original snow crystal may be altered because of the new physical factors encountered. This sometimes results in a combination of crystal types. For example, needles may grow on hexagonal plates or hexagonal plates may grow on the ends of columns.

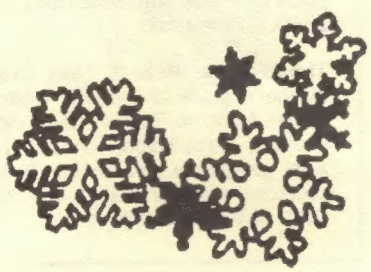


The descending snow crystal may also be altered by a process called riming. If a crystal hits a supercooled water droplet, instantly the droplet freezes onto the crystal in no geometric order. The frozen droplet is called rime. As the crystal continues to strike supercooled water droplets, the rime becomes greater, distorting and destroying the crystalline symmetry. Eventually a crusty pellet, called graupel, is formed and falls from the cloud.

Once the snow crystal leaves the cloud, its fate is dependent on air temperature. In summer, the snow crystal melts and falls as a raindrop. In winter, the snow crystal reaches the ground but again its shape may be altered by the rate of descent, with the leading edge becoming distorted, or may be broken by bumping into other crystals.

In the course of the snowstorm, the type of snow crystals that fall may change. Take a break from shoveling and look at the snow crystals clinging to your sleeve. Remembering that each type is dependent on very specific physical conditions within the cloud, you now know what is happening thousands of feet above your head.

—From: *The Lake Flyer, Newsletter of the Winnebago Audubon Society*, Jan 1989, Vol. 9, No. 1. Reprinted with permission.



Protecting the Ozone—CFC Substitutes

by Mary Kadlecek

My refrigerator has CFCs in it. So does my car air conditioner. And its a good bet that yours do, too. Now that we've decided to stop making CFCs (chlorofluorocarbons), we're going to have to find other ways to do some important jobs:

- Refrigerating and air conditioning, in which CFCs move heat by evaporating and condensing in endless cycles (about 30 percent of worldwide CFC use);
- Foaming rubber and plastics for insulation, packaging and padding (about 28 percent);
- Cleaning the debris of manufacturing from the microcircuitry that controls everything from cars to space hardware (19 percent);

Another 19 percent of the world's CFCs goes into aerosol sprays, which were banned in the U.S. in 1978. Few of us realized when we stopped using CFC-propelled sprays that our spray cans were only the "tip of the iceberg." To end the threat to the ozone layer, we may have to stop CFC use completely. For starters, in the federal Clean Air Act amendments of 1990, Congress banned production of most CFC compounds and three halogens (fluorocarbons) by January 1, 2000. This ban will bring about changes for industry and consumers.

Dependable, versatile and easy to manufacture and use, CFCs are a hard act to follow. As substitutes, researchers are testing helium refrigerators, as well as water- and hydrocarbon-based cleaners and foaming agents. For very demanding CFC applications, such as high-end electronics production and automotive air conditioning, the best short-term possibilities seem to be compounds called HFCs and HCFCs (hydrofluorocarbons and hydrochloroflourocarbons). Chemical cousins of CFCs, these less stable compounds will persist for years, but not centuries in the air and have only a fraction of CFCs' ozone depletion and global warming potential. But substitutes cost several times as much to produce as CFCs and their long-term acceptability is doubtful.

Even with chemically similar materials, replacing CFCs is not just a matter of draining and refilling. Billions of dollars worth of equipment now using CFCs will have to be modified; oils, lubricants, gaskets and epoxies compatible with CFC substitutes must be developed. Similarly, car air conditioners, which have little tolerance for variability in the refrigerants they use, will probably need modifications. Even HFC/HCFC blends with heating properties close to CFCs will not be interchangeable with existing compounds.

The worldwide process of replacing CFCs seems like a good bet to give us a lesson in the complexity and interdependence of our modern technical-industrial society.

—From *Conservationist* magazine. May-June 1991. Vol. 45, No. 6. New York Department of Environmental Conservation. Reprinted with permission. For more information on the 1990 Clean Air Act amendments, contact: The Wisconsin Department of Natural Resources, Bureau of Air Management, P.O. Box 7921, Madison, WI 53707.

Acid Rain Study Opportunities

Two on-going projects provide opportunities for students in grades 4-12 to study acid rain and its effects:

The *Backyard Acid Rain Program* (BARK) is aimed at grades 4-10. In this program, students monitor atmospheric conditions and pH of precipitation for a thirty-day period. The specially designed monitoring kit can easily be used by children while still ensuring scientific validity. Participants can choose one or more of three monitoring periods in fall, winter and spring, and have the option of being twinned with another classroom in North America.

A "Communications Package" provides an explanation of the acid rain issue through a series of experiments, games and activities. The package also contains acid rain facts, articles, and reference material. Update newsletters, a poster, certificates of achievement, and a final colorized map showing the acid precipitation levels throughout Canada and the U.S. make the program informative and fun.

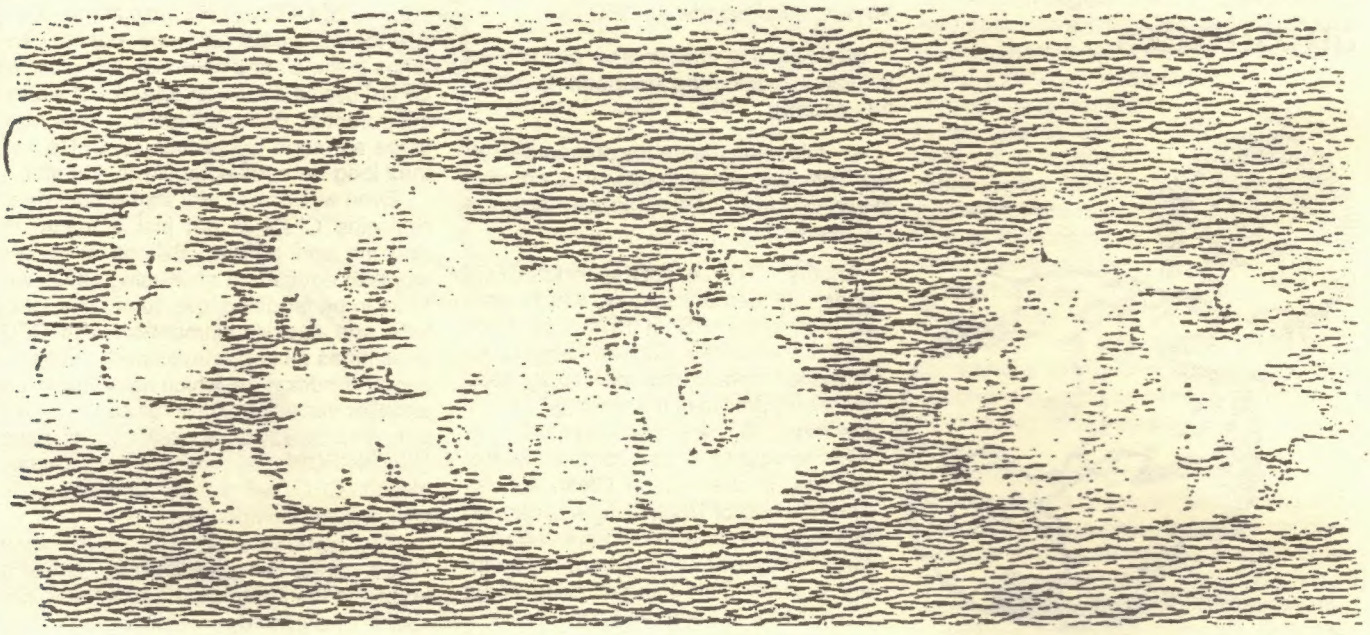
BARK serves as an interdisciplinary classroom project that integrates science, English, geography, mathematics, and other subject areas. BARK fosters the idea that the problem is not all "gloom and doom" and that students can be instrumental in finding a viable solution to acid rain. For more information contact: Public Focus: BARK Headquarters, 489 College St., Suite 500, Toronto, Ontario, M6G 1A5, 416-967-5211; FAX 967-4450.

A similar program, *Project TARP-IT* (The Acid Rain Project—International Twinning) is looking for a limited number of additional schools to participate in an international acid rain investigation aimed at middle and high school level students.

The study is comprised of two stages—schools can participate in one or both. In the first stage, tentatively scheduled for October, students collect rain for one month according to an approved methodology. The second stage is planned for February, when students will investigate the effects of different patterns of acid precipitation on plant growth. Students will use data from the first stage to produce lab simulations of a range of climates under which growth can be studied.

Ninety schools in the U.S., Bermuda and Spain and twenty five schools in England plan to take part in the study. The benefits of Project TARP-IT include the valuable experience of collaboration in an international scientific research project and increased competence in carrying out experimental research. Contact: Michael Demchik, P.O.Box 1420, Shepherdstown, WV 25443, 304-267-9736 or 304-725-8491.

Mackerel Skies and Mares' Tails



by Linda Renshaw

The wondrous heaps of water vapor and ice crystals we call clouds can give valuable clues to to approaching weather conditions. While there is surely nothing certain about using clouds to help predict the weather, scientists spend a great deal of time studying the sky, and the changing shapes and action of clouds play a major role in modern meteorology.

Moist air, evaporated from lakes, oceans and rivers or from damp soil and plants, rises and becomes cooler. As the temperature drops, water vapor and ice crystals form around microscopic particles called condensation nuclei, becoming more dense, up to about 2,800,000 droplets per cubic foot. In the process, the swelling drops gain visibility: a cloud. The sequence of events surrounding the formation of this structure provides forecasters with vital clues to the movement of fronts and impending precipitation.

Clouds are grouped by the World Meteorological Organization into classifications based on a system devised in 1803 by Luke Howard, a London-born pharmacist. He gave Latin names to three main forms of clouds: stratus ("layer"), cirrus ("curl" or "hair"), and cumulus ("heap"). These names have been combined with various prefixes for the terms now used to group clouds by appearance and height into genera and species, much as plants and animals.

The low-based clouds (below 6,500 feet) fall generally into four categories, *Stratus*, a layer cloud resembling a smooth, uniform sheet, hangs like a dirty grey fog above the ground. Often this is only about two thousand feet thick and may be only five hundred feet above sea level. Intermittent drizzle (or snow if the air is cold enough) usually falls from stratus clouds, but many times the precipitation evaporates before it reaches the ground. If the layers break into fragments, the resulting formation is called *fractostratus*. Stratus clouds shattering early in the day with patches of clear sky between indicate fair weather.

Stratocumulus are also low-level clouds but have a more wavy appearance. Soft-dark-grey in color, these are generally shallow and heavy and may cover the skies for seemingly endless dreary days, neither producing moisture or allowing the sun's rays to penetrate.

The puffy marshmallows generally depicted as "clouds" are called *cumulus* and can be heaped in great piles, their bases low but their well-defined tops rising to twenty thousand feet or more. Cumulus clouds may be small, floating gently along or large and cauliflower-shaped with flat bottoms. During settled weather, these are benign and dot the tranquil skies prized by artists and backpackers.

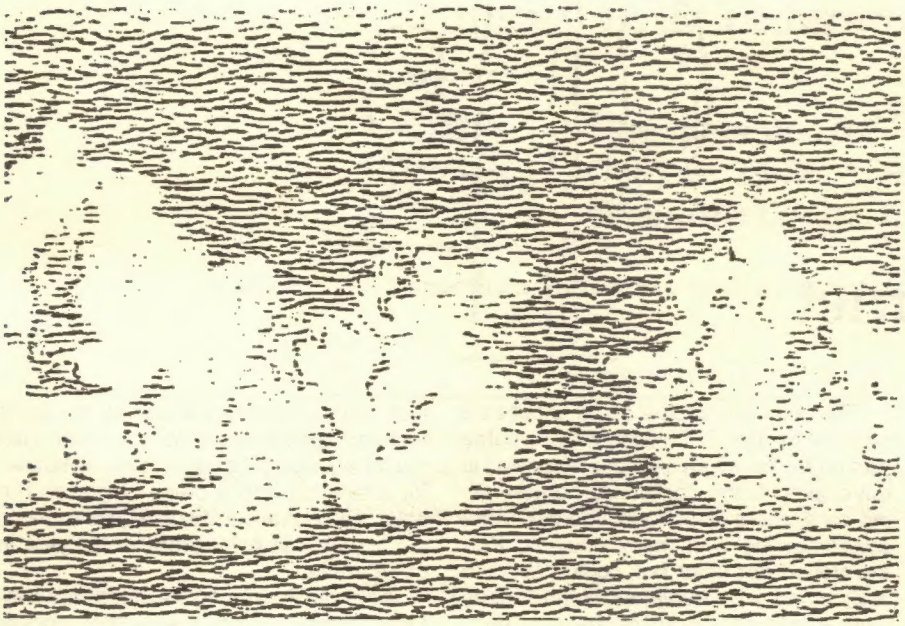
Thermal convection currents, which occur when the air's temperature is lower than the earth's, surge upward and promote condensation, producing dense cloud formations that grow lofty and may soon yield showers. During disturbed periods of weather, cumulus can quickly transform into the next, most spectacular type of cloud.

Upcurrents in *cumulonimbus* or shower clouds may reach speeds of a hundred feet per second or more; if the air entering has some natural rotation, a funnel cloud may be produced and a tornado (over land) or a waterspout (at sea) can result. The top of a cumulonimbus cloud soars into colder regions, sometimes as high as forty thousand feet or more, and the water vapor in the cloud freezes into ice crystals. The leading edge blurs, spreads and often assumes an anvil shape. Heavy rain, thunder and lightning follow, and a thunderhead is in full bloom.

The three middle- or intermediate-level (from 6,500 to 23,000 feet) cloud types generally create an overcast sky. *Altostratus* is a thick, layered, irregular cloud through which the sun may shine weakly (leading to the description "a watery sun"). The layers may appear as a grey sheet and are generally high enough that they are composed of ice crystals. Depending on other conditions, such as wind velocity and direction, these clouds can herald prolonged rain or snow.

Altocumulus clouds are thicker and dappled in texture. They may appear as if

"Mackerel skies and mares' tails
Make tall ships carry short sails."



arranged in shaded, lumpy rolls but have the rounded configuration their name implies. This is the "mackerel sky" of the adage and bears out the suggested unpredictably. These clouds are made up of water vapor rather than ice and can produce the optical phenomenon referred to as a corona, a ring around the sun or moon, not to be confused with a halo (which results from light refracted through ice crystals).

Nimbostratus clouds bear rain and are either dreaded or welcomed, depending on the needs of the beholder. They form a dark, thick layer, the base lowering and yielding steady rain or snow. Beneath this dense, deep-grey blanket may scurry small broken clouds, termed scud or fractostratus.

Another dappled form of cloud associated with the term "mackerel sky"—this one occurring at high levels (above 23,000 feet)—is *cirrocumulus*. Broken into delicate, wavy patterns, these clouds have a lovely feathery structure and are clear, shadowless white. They are composed of ice crystals, as are all the cirro-class clouds. Combine this type with westerly winds, and the outlook is for fair, bright weather, if the clouds thicken and lower, rain generally follows within twenty-four hours.

Cirrostratus clouds lend a vague, milky cast to the sky. This thin veil creates the halo that is often visible around the sun, a ring that can have colors bright as a rainbow or be broken into fragments. Despite its frequent appearance, such a halo is said to presage bad weather. ("If the sun is in its house, it will rain soon.") The cloud layer may remain barely discernable, separate into straight filaments or, or thicken into cirrocumulus with the approach of a storm center.

Finally, *cirrus* clouds are the silky, far-away wisps that resemble streaks or bands. Ice crystals trailing from them lead to the name "mares' tails" and can curve like hooks with tufted heads. Ascending hooks are said to indicate storms and winds; descending hooks call for calm and dryness. These very high clouds are usually a product of low humidity and travel at great speeds. They are very early indicators of an approaching warm front, bringing with it wind and possibly rain.

Add to these ten classes the myriads of scientific types devised by weather-watchers: cumulonimbus mamma, altostratus translucidus and cirrus uncinus, among others. Then consider wave clouds and convection clouds, not to even mention fogs—a whole other story. Clearly, the sky's the limit and devotees of these misty configurations have enough to occupy them for lifetimes. Nature's atmospheric offerings are ours for the taking—we just need to look up.

—Adapted from: "Daughters of Earth and Water," in *South Carolina Wildlife*, August 1989, Vol. 36, No. 4. Reprinted with permission.

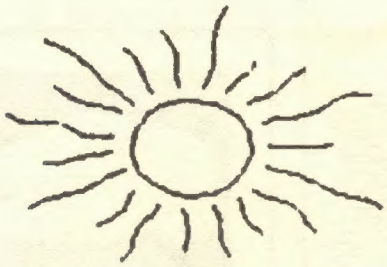
Photographing Clouds

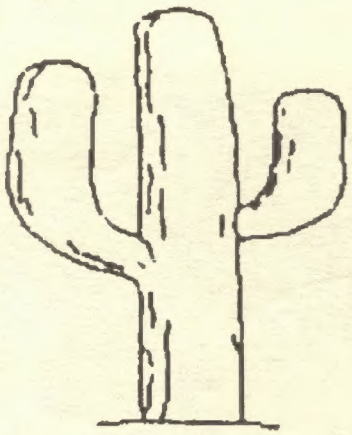
—by John Day, Ph.D.

Photography is a great tool for art and science. All you need is a camera, film and a little practice. The following tips can help you and your students capture the beauty of the sky on film.

1. Hold the camera steady.
2. Think "composition," eliminating unnecessary foreground.
3. Shoot early in the morning or late in the afternoon for maximum effect.
4. Use a polarizing filter (if you have a SLR camera) to enhance the contrast between cloud and sky.
5. Don't shoot toward the sun unless you're photographing the Halo. In the latter case, block out the sun disk with some physical obstacle. *Never look through the viewfinder directly at the sun—eye damage can occur.*
6. Try to shoot cloudscapes with a sky to ground ratio of 3:1 (as opposed to landscapes with the opposite ratio).
7. Remember, skies with the greatest contrast make the best pictures.

Meteorologist and nature photographer, John Day is the author of *Peterson First Guide to Clouds and Weather* (see Books).





The Solar Gourmet

by Jo Temte

I've heard of sun tea, but sun bread? sun muffins? sun pork roast? According to Babara Kerr and Sherry Cole, nearly anything that can be cooked in a conventional oven will cook in their solar box cooker—it just takes a little longer.

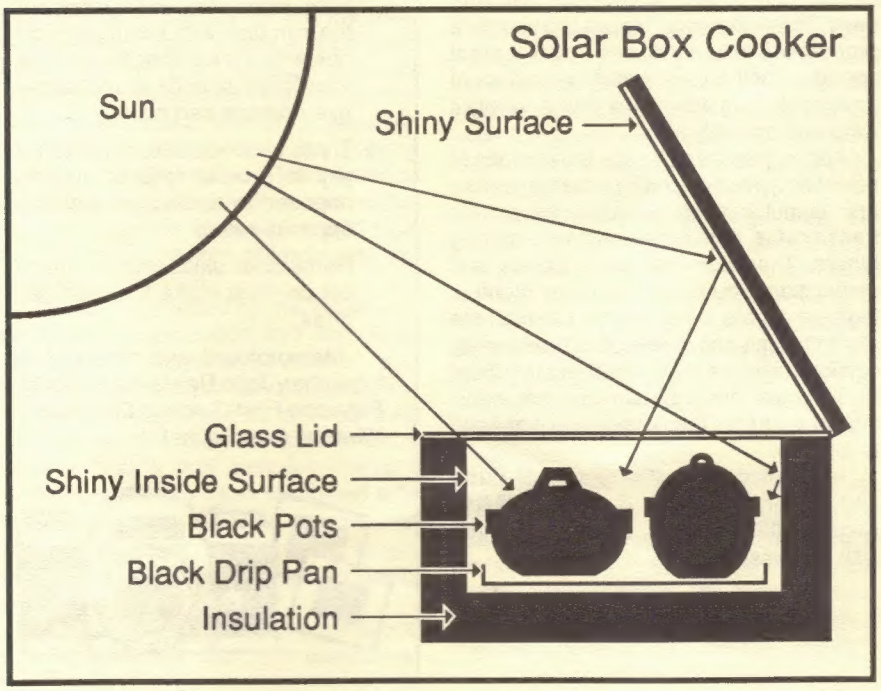
What's a solar box cooker? It's four square feet of sunshine trapped inside a cardboard box-within-a-box. An adjustable reflector directs sunshine into the box through a tight-fitting glass lid. Food is cooked in dark pots which absorb the sun's energy. Several pots of food—enough for an entire family—will cook in 2-5 hours at temperatures that peak between 250 and 325° Fahrenheit. "Sun food" doesn't need stirring and won't overcook. It also retains nutrients and flavor since no steam escapes.

The solar box cooker came about as a result of the first Earth Day, when a nurse named Barbara Kerr became interested in developing Earth-conscious home-making as a viable lifestyle for the city. After experimenting with many designs, Kerr developed her solar box cooker in 1976 and, along with freelance writer Sherry Cole, turned a backyard hobby into a business.

The idea of trapping sunlight in a box goes back decades. Many styles have been tried, but many of the early cookers were expensive, unstable, inefficient, difficult to maintain and required constant attention during cooking. Kerr claims her solar box cooker works because it was designed by grandmothers, not engineers. According to Kerr, "Our solar box is so simple that it disappears below the line of sight of people looking for 'technology.'" In fact, all you need for the easiest design is two corrugated boxes (one smaller than the other), a pint of glue, a lot of newspaper for insulation and a piece of glass. The solar box cooker can be used year round in the tropics and 6-8 months of the year in other areas.

As I write this during the July heat wave, I can envision what a solar box cooker could do for me—a hot meal without a hot kitchen. Harnessing the free energy of the sun also saves on electricity costs and environmental impacts. In tropical regions, the SBCs can have far greater impact by slowing the destruction of tropical forests for cooking wood. Kerr also notes that women in third world countries spend the greater part of their day gathering wood and dung, nurturing fires and preparing food, leaving little time for other tasks, let alone leisure. Cooking with the sun could free millions from these tasks.

Realizing this potential, the simple invention of two grandmothers became a movement in 1987 when Kerr, Cole, and microbiologist Dr. Robert Metcalf founded Solar Box Cookers International. SBCI is a non-profit organization to promote solar box cooking worldwide. Pillsbury Co., the United Nations, the Church of Latter Day Saints and others have sponsored SBCI projects and training sessions in Guatemala, Morocco, Zimbabwe, Niger, El Salvador, New Guinea, Chad, Ethiopia, South Africa, Haiti, Mexico and the Dominican Republic. Kerr, Cole and Metcalf were nominated in 1989 for a Nobel Prize as a result of their work with solar box cookers.



—Information compiled from personal communication and articles provided by Sherry Cole, Vice President, Kerr Enterprises, Inc. Complete cookers, kits, designs and cookbooks can be ordered from: Kerr Enterprises, Inc., P.O. Box 27417, Tempe, AZ 85285. For additional information on solar box cookers, send a self-addressed, stamped envelope to Solar Box Cookers International, 1724 11th St., Sacramento, CA 95814.

Copy this flyer and share it with a friend!

Wisconsin Association for Environmental Education Annual Fall Conference:

"Partnerships for the Earth"
October 23-26, 1991
Telemark Lodge, Cable, Wisconsin

Discover new connections to enhance your environmental education efforts!

Conference Tracks

***At Work in Our Schools*—Partnerships in Formal Education**

Practical Sessions for educators provide ideas for EE through joint efforts with resource agencies, communities and industry. Topics include techniques like cooperative learning and group process, grant writing and the latest teaching materials.

***Beyond the Classroom*—EE in Non-formal Settings**

Educators in places like parks, nature centers and museum will learn the "how-to's" of forming partnerships with communities, school districts and interpretive programs.

***Connecting with the Experts*—Developing a Resource Network**

These sessions will provide practical assistance in network building, for educators as well as resource professionals from state and federal agencies, industry and other areas.

***Meeting the Challenge*—Issues Investigation and Action**

This track deals with issues—from biodiversity to treaty rights.

***Environmental Education on Stage*—A Partnership with the Arts**

Exploring opportunities to combine the arts with environmental education, sessions will include art forms like storytelling, music, American Indian art and creative dance.

Field Trips:

National Park Service Boat Tour to the Apostle Islands, Chippewa Flowage Tour and Visit to the LCO Indian Reservation, Hiking on the North Country Hiking Trail and through the Drummond Woods, Tour of the Drummond Sanitary Bog, Tour of the Cable Natural History Museum, Canoe Trips down the Namakagon River

Yes! Send more information about the WAEE Fall Conference to my home!

Name _____

Home address _____

City _____ State _____ Zip _____

Mail to: WAEE, 7290 County MM, Amherst Junction, WI 54407

Lodging and Meals

A choice of options will be available from Telemark Lodge and surrounding facilities in a variety of price ranges. Camping in the National Forest will also be available. Details will follow with registration materials.

Keynote Speakers

***Paul Schurke*—Arctic Explorer**

Hear how a partnership has been forged between Russia and the U.S. which will result in the "Superior-Baikal Connection." A cooperative endeavor, Schurke's latest adventure will explore these two great freshwater lakes by kayak to gain an understanding of the environmental problems they both face. Schurke was co-leader of the 1986 Steger Expedition which traveled to the North Pole via dogsled in 55 days, traveling a thousand miles and enduring temperatures of -70° F!

***Smithsonian Institution Traveling Exhibition Service*—Speakers**

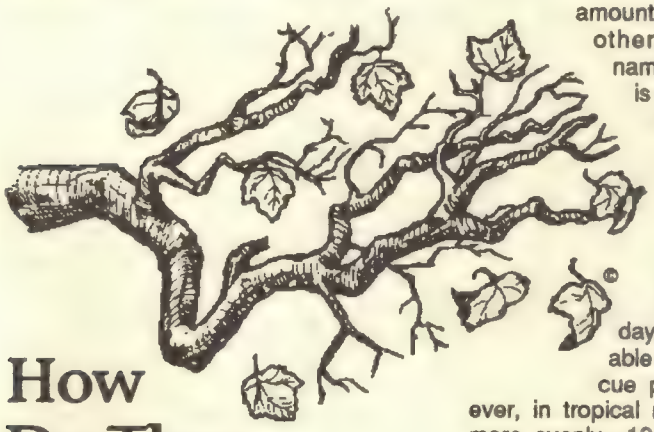
Cooperative ventures with organizations and institutions throughout the U.S. and abroad by SITES have resulted in highly acclaimed exhibits on such topics as biodiversity and tropical rainforests.

***Jeff Rennicke*—Outdoor Writer**

As Midwest field editor of *Backpacker Magazine*, and author of 7 books and over 200 articles, Jeff stresses the importance of nature writing as a voice in the environmental movement.

Conference registration materials will be mailed early in August!

Nature Notes



How Do They Know?

Summer is over. In a few short weeks our temperate forests will begin their annual dazzling color show. Trees have no eyes to sense the shortening days and no nerves to feel the autumn chill. Yet, every year at this time, they begin their preparation for winter. How do they know?

Sensing Seasons

Trees and other plants synchronize growth processes—budding, shoot elongation, leaf abcission, dormancy—with the seasons by responding chemically to seasonal environmental cues. In temperate areas decreasing daylength and falling temperature signal the onset of fall.

Phytochrome is the primary pigment involved in light detection. This pigment is a protein with a light sensitive portion that undergoes conformational changes when illuminated. Phytochrome is sensitive to both amount and quality of light. Another unknown pigment named cryptochrome, which is especially sensitive to the UV-blue region of the light spectrum, seems to be responsible for rapid light responses such as the opening and closing of flowers.

In temperate areas, daylength is sufficiently variable through the seasons to cue plant responses. However, in tropical regions, days are split more evenly—12 hours of light and 12 hours of dark at the equator—and trees and other plants (as well as animals) must rely on cues other than daylength (e.g. temperature, moisture, etc.) for physiological cycles.

Changing colors

A green leaf is green because of the presence of a group of pigments called chlorophylls. When chlorophylls are abundant in the leaf's cells, as they are during the growing season, the chlorophylls' green color dominates and masks the colors of any other pigments that might be present in the leaf. Thus the leaves of summer are characteristically green.

Chlorophylls capture the sun's energy and use it to manufacture the plant's food—simple sugars that are produced from water and carbon dioxide. This process is called photosynthesis. Photosynthesis continually "uses up" chlorophylls, but the plant replenishes the chlorophyll supply during the growing season and the leaves stay green.

As autumn approaches, environmental and internal influences cause the chlorophylls to be used up faster than they're being replaced. As the supply of chlorophylls dwindles, the "masking" effect slowly fades. Other pigments that have been present in the cells all during the leaf's life begin to show through. These are the carotinoids; they give us colorations of yellow, brown, orange and the many hues in between.

Autumn reds and purples come from another group of pigments called anthocyanins. These pigments develop in the late summer in the sap of the leaf cells. Formation of anthocyanins depends on the breakdown of sugars in the presence of bright light as the level of phosphate in the leaf is reduced.

During the summer growing season, phosphate is at a high level. It has a vital role in the breakdown of sugars manufactured during photosynthesis. But in the fall, phosphates and other chemicals, and nutrients move out of the leaf into the stem of the plant. When this happens, the sugar breakdown process changes, leading to the production of anthocyanin pigments. The brighter the light during this period, the greater the production of anthocyanins and the more brilliant the resulting color. When the days of autumn are bright and cool, the nights chilly but not freezing, the brightest colors usually develop.

Anthocyanins show up vividly in maples, oaks, sourwood, sweetgum, dogwood, and persimmon. These same pigments combine with the carotinoid's colors to give us the deep oranges, firery reds, and bronzes typical of many of the hardwood species.

Falling Leaves

When a tree senses shorter days, less intense sun, and cooler temperatures of autumn, it begins to form a layer of weak cells, called the abcission layer, at the base of the leaf stalk where the leaf attaches to the twig. As the layer grows, it constricts the leaf's circulatory system, and leaf metabolism slows. Less water reaches the leaf for photosynthesis, and less food is carried from the leaf to the rest of the tree.

Eventually, the abcission layer completely plugs the tubes that carry the leaf's water and mineral supply. With the help of wind or frost, the leaf breaks loose and falls to the forest floor. But before the

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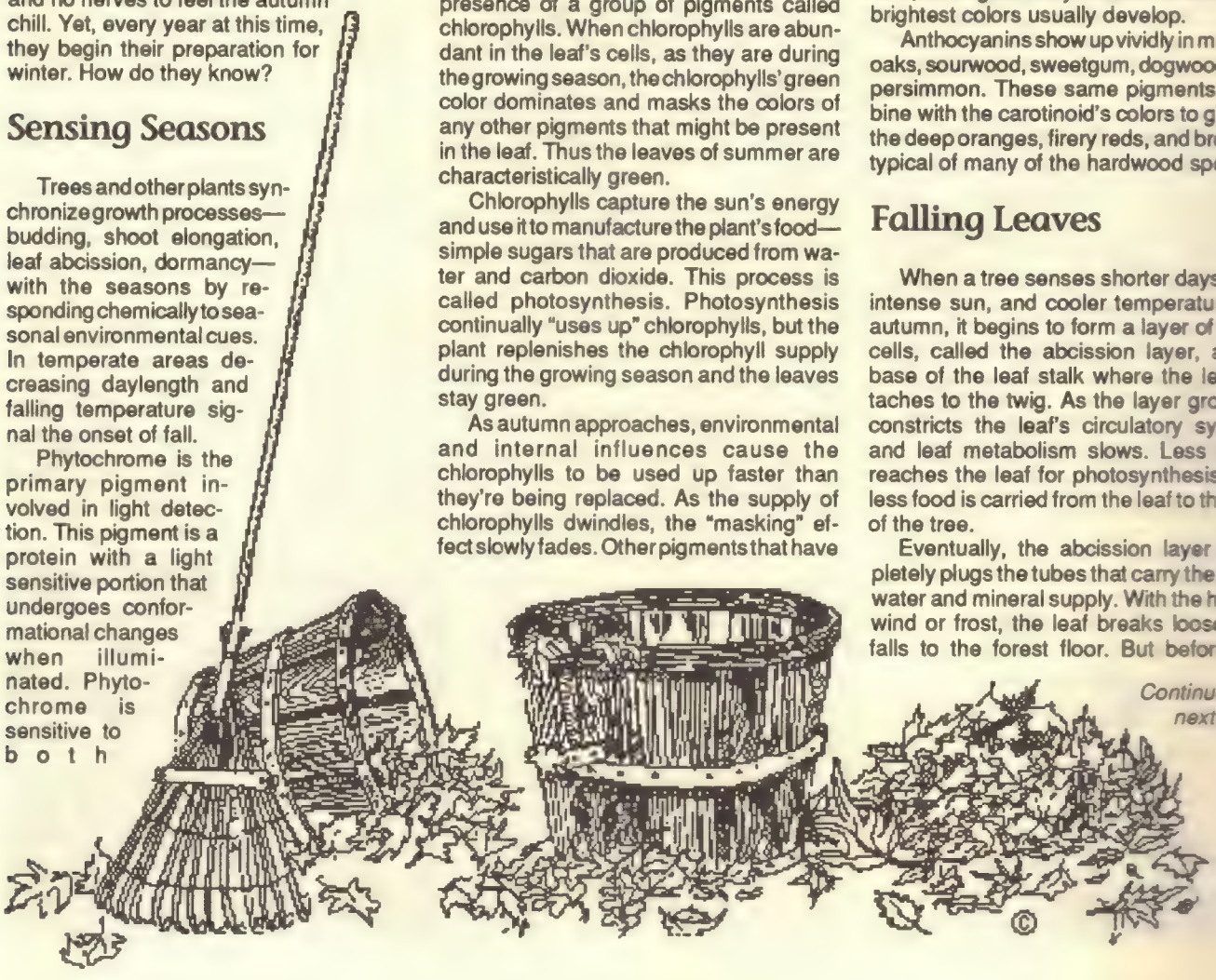

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leaves drop, tiny buds that hold the next spring's leaves have already formed at the base of the leaf stalk—ready to burst when longer days signify the beginning of a new growing season.

Leaf abcission in some species such as smooth sumac and yellow poplar is controlled mainly by light—leaves are retained while days are long and shed when days become shorter. In other species, such as black locust and white oak, temperature is the primary controlling factor in leaf abcission. Leaves of these species remain on the trees until air temperature reaches a critical low.

Interestingly, street and parking area lights may actually prolong leaves on trees such as silver maple that rely primarily on light cues for leaf abcission. This delay in leaf dropping can increase a tree's susceptibility to late autumn and winter weather.

—Compiled and adapted from: *Autumn Colors Poster*, U.S. Forest Service, Southern Region, Suite 800, 1720 Peachtree Rd. NW, Atlanta, GA 30367; *Sierra*, Sept-Oct 1987, pp 96-99; with information from: *The Physiological Ecology of Woody Plants*, Theodore T. Kozlowski, et. al., 1991, Academic Press, Inc., San Diego.

Winter star gazing

by Edward Raventon

Cold, clear air pours down from the north, snow crunches underfoot and the deep, dark nights are hung with brilliant stars. Long, clear nights make winter the best season to gaze at stars and rediscover the constellations. Stars can be mathematically weighed and measured. Constellations are different. They are arbitrary groupings of stars, inventions of human imagination to help organize and map the night sky.

Winter constellations center on Orion, the Great Hunter who once boasted that no animal could overcome him. Jupiter, the chief god, sent a scorpion in response to Orion's bragging. The tiny, unseen scorpion bit Orion on the heel, killing him instantly. Orion was placed in the sky with his two hunting dogs (Canis Major and Canis Minor) and Lepus, the hare he was chasing. The scorpion that bit him was placed there too, but on the opposite side of the heavens as a reminder to those who would boast too loudly of their greatness.

The winter sky also includes Tarus the Bull, which represents Jupiter when he took this form to carry off Europa, a young and beautiful princess. Contained within Taurus is another, smaller constellation known as the Seven Sisters or the Pleiades. The Pleiades represent a spot on the bull's shoulder. According to the old myths, the Pleiades represent the seven daughters of Atlas, the giant who once supported the world on his shoulders.

The Pleiades are actually a cluster of several hundred stars wrapped in a faint white veil of rarefied gas. Only seven of the brightest stars in the cluster are visible to the unaided eye. To be able to see all seven has been considered a test of good eyesight since Biblical times.

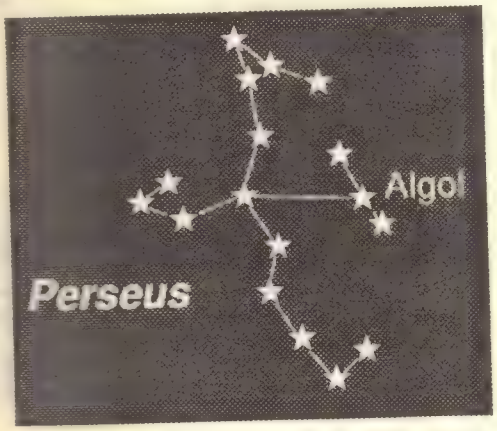
Six constellations, including two from the circumpolar group (which are visible all year), are drawn together in one famous Greek legend of Amdromeda. The legend includes the hero Perseus, the winged horse Pegasus, the king and queen of Ethiopia (Cepheus and Cassiopeia), and their fair daughter Princess Andromeda.

King Cepheus and his vain queen, Cassiopeia (the two circumpolar constellations), lived happily in their kingdom until the queen foolishly offended the sea nymphs. The nymphs responded by sending Cetus, a great sea monster that ravaged the coast and killed many people. The monster would depart only if Princess Andromeda was offered up for sacrifice.

Andromeda was chained to a huge rock by the sea to await her doom. But just as the monster appeared, so did Perseus, the son of Jupiter. Perseus killed the sea monster, rescued the beautiful Andromeda and instantly fell in love with her. In thanks for saving his daughter's life, Cepheus gave her hand in marriage to Perseus. They lived, as you might imagine, happily ever after.

These are just a few of the stories ancient storytellers enshrined in the winter constellations so that people who gazed at the stars might remember the lessons and myths of those who had gone before them. Sky myths also bring with them a powerful human touch that helps one orient to the vast universe of stars while crunching through the snow on a cold, clear winter night.

—Adapted from: "The Winter Sky," in the *Dakota Naturalist* magazine. Reprinted with permission.



Light Pollution: A Threat to the Night Sky

by Tom Renner, P.E.

For thousands of years the night sky has been a source of mystery, peace, inspiration, fear and wonder; now a glimpse of a truly dark sky is a rare event. In many areas, light pollution has stolen the night sky.

Light pollution pervades all inhabited areas. Like so many types of pollution, the loss of the dark sky occurs gradually. First, the faintest "deep sky" objects disappear from the eyepiece of a telescope, then faint "naked-eye" stars, then the Milky Way... As an amateur astronomer, I am more aware of the loss than most, yet all of us lose as this precious natural resource slowly disappears from sight.

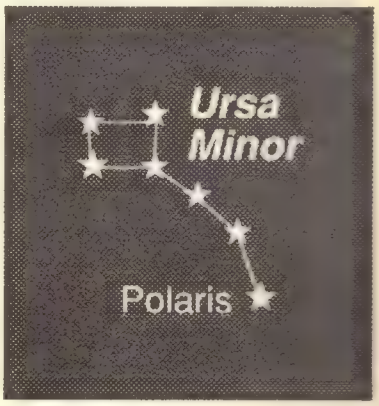
There are two forms of light pollution: artificial sky glow and glare. "Sky glow" is caused by light from residential, commercial and municipal fixtures that shine directly up into the night sky (such as floodlights directed up toward buildings and billboards), as well as light that reflects off snow or the ground itself. Light from improperly aimed, or poorly shielded light fixtures is scattered by haze, particulates, smog and air molecules, and reflected back down to the ground. The result is an overall brightening, giving the sky a permanent twilight appearance. Sky glow is most easily recognized as the dome of light seen over distant cities.

"Glare" is light that shines directly into one's eyes instead of the object that is supposed to be illuminated. A familiar example of glare is the bright light from an oncoming car when the driver has failed to dim the high beams. High intensity metal halide and metallic vapor luminaries used in commercial lighting are primary sources of glare. This type of lighting can also waste energy. In addition, it can actually reduce visibility, thus creating the need to compensate by increasing adjacent lighting (for example adding street lights to prevent distraction by the glare of commercial lights near roadways).

Light pollution—both sky glow and glare—can be reduced through use of "sharp cutoff" type light fixtures. Properly installed, this type of light casts no light above the horizontal plane, and confines light output to the area to be illuminated. Light intensity should also be limited to an appropriate level; energy is wasted and night sky is lost to over-illumination.

Many professional and amateur astronomers and other night sky enthusiasts hope to increase awareness of light pollution and push for regulation of lighting practices. While light pollution may not irritate our eyes or our lungs, it is just as real as other forms of atmospheric pollution. Without action, future generations may not have the opportunity to learn the constellations, wonder at the planets or wish on the first evening star.

For more information on light pollution, contact: The International Dark Sky Association, P.O. Box 26732, Tucson, AZ 85726.



Song of the Stars
We are the Stars which sing,
We sing with our light.
We are the birds of fire,
We fly over the sky.
Our light is a voice,
We make a road
For the spirit to pass over.

—Algonquin song

Get into Project WILD Wisconsin

Project WILD/ Learning Tree Update

Project WILD/Learning Tree
PO Box 7921
Madison, WI 53707
608-266-0870/267-2463

PLT

Environmental Exchange Box Partners Wanted

The PLT office will begin coordinating environmental exchange box activities with other states this fall. Potential partners include classes from Wisconsin, Kentucky, Missouri, Montana, New Jersey, New Mexico, Oklahoma, New Hampshire, California and American Samoa. If you're interested in setting up an environmental exchange, please send a note with your name, grade level, and school address to the WILD/PLT office.

Welcome Kirsten!

In March, we welcomed Kirsten Held, forestry appreciation specialist, to the Education Section of the Bureau of Information and Education. This new position, promoted by the Governor's Council on Forestry, is funded jointly by the State and private donations.

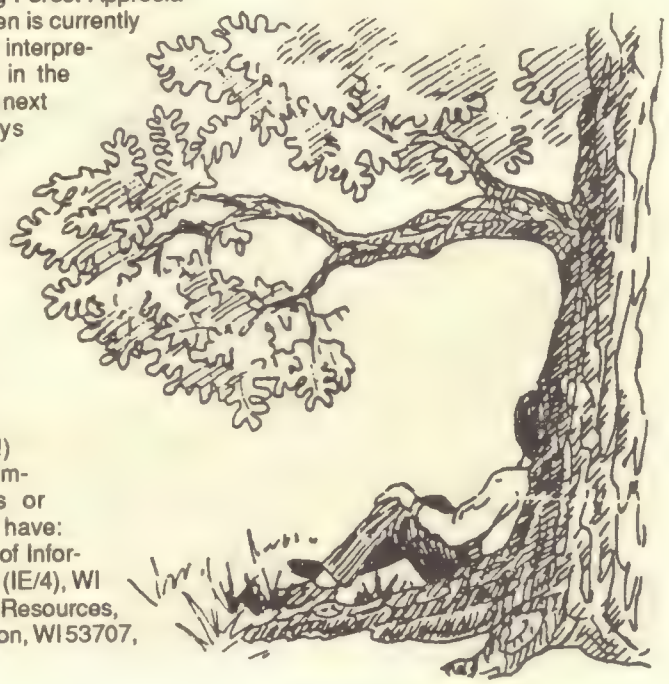
Kirsten's first assignment was to coordinate activities for the annual Forest Appreciation Week celebration—which included Earth Day and Arbor Day—at the end of April. Kirsten's ten years experience in promoting an appreciation of the forest and forest education activities helped make Forest Appreciation Week a success.

Following graduation from Iowa State University with a degree in forest management, Kirsten moved to Ketchikan, Alaska, where she spent a decade working for a private, non-profit forest industry association. As part of her job, she helped lead several natural resources camps for students, presented numerous talks in school classrooms, and was a coordinator for Project Learning Tree-Alaska. Although the grandeur of Alaska has permanently claimed a portion of her heart, Kirsten says she is pleased to be back in the Midwest since her roots are in an Iowa farm.

In addition to preparing materials for teachers to use during Forest Appreciation Week 1992, Kirsten is currently coordinating a forestry interpretive program for use in the state parks and forests next summer. Kirsten says she is looking forward to meeting and working closely with Wisconsin teachers to nurture a better understanding and appreciation of Wisconsin's forest resources. (Look for Kirsten's October 25 workshop at the WEAC convention!) She welcomes any comments, suggestions or questions you might have: Kirsten Held, Bureau of Information and Education (IE/4), WI Department of Natural Resources, P.O. Box 7921, Madison, WI 53707, 608-267-3120.

WILD/PLT Workshops

WILD and Learning Tree workshops are listed in the Calendar section of *EE News*. New workshops are always being scheduled and sometimes miss being announced in *EE News*. Contact the Project WILD/Learning Tree Office for an update of those being offered in your area.



WILD About Insects and Arachnids

by Susan Gilchrist, Project WILD Research Coordinator, DNR, Madison

As part of a Project WILD research project, I had the opportunity to observe 16 fourth grade classes around Wisconsin during the 1989-90 school year. To share some of the stimulating activities I saw, I've adapted them to the popular theme of "Insects and Arachnids." These ideas are intended to be supplementary, not all-inclusive.

First, define the goals of the educational unit. One goal is to build an appreciation for insects and the importance of their role in nature's larger scheme. To introduce the unit, adapt the Project WILD activity "First Impressions" to focus on insects. Show students pictures of insects like ladybugs, ants, mosquitos, dragonflies, moths, honey bees, houseflies, and grasshoppers. Have students write down or call out the first words that come into their minds as you show each picture. Proceed with a discussion about each insect, its interaction with humans, and its place in the web of life. Compare student impressions with the facts. Include factors such as damage to crops, place in the food chain, potential for carrying disease, pollination of plants, natural recycling, beauty, socialization and communication within insect groups, etc.

A good follow-up or alternative activity is an adaptation of "Interview a Spider." Introduce interview techniques. In pairs, students choose an insect or spider to research briefly and then interview in front of the class. One student plays the role of the reporter, the other the insect. Through questions and answers, the players lead their classmates to guess the identify of the insect or spider.

Expand the above activity by interviewing "wild neighbors." Assign roles to volunteers from the class and interview each about the chosen insect or spider (wild neighbor). For example, students playing the roles of a beekeeper, a nurse, and a flower could be interviewed about a bee; a dog afraid of getting heartworm, a bat who eats mosquitos, and a person at the beach could be interviewed about a mosquito.

Take this activity one step further by interviewing parents or other people in the neighborhood about their attitudes towards selected insects/spiders and tallying and graphing responses in true research style. Summarize and discuss results and compare attitudes with facts.

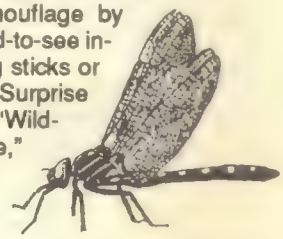
For an art project, try the activity "Invent and Insect"—a new adaptation of "Fashion a Fish" (see WILD Resources). Review the parts of an insect and adaptations different insects have for survival. Ask students to create their own insect, with appropriate body parts and innovative adaptations for living in a particular habitat. Provide colored paper, crayons, markers, paint, string, glue, staplers, fabric scraps, telephone wire, pipecleaners, etc. Have students introduce their insect to the class, explaining how it's adapted for survival.

In language arts, students can create a picture of an insect with words, either descriptively or literally. For example, write the word "wing" repeatedly to create the shape of a wing, or "thorax" to define the shape of the thorax.

Discuss the meanings of insect-related phrases like "butterflies in my stomach," "mad as a wet hornet," "a fly in the ointment," "a social butterfly," "busy as a bee," and more. What attitudes do these sayings reflect? In what ways are they related to fact?

Have an insect olympics. Students can research insect abilities, such as how many times its own height a flea can jump and how many times its own weight an ant can carry. Then have jumping and carrying contests to see how close to their own height and weight students can come, without hurting themselves.

Additional activities from the Project WILD guides can be adapted to focus on insects and spiders. Students learn about camouflage by searching for hard-to-see insects like walking sticks or grasshoppers in "Surprise Terrarium." With "Wildlife Is Everywhere," students can seek signs and evidence of insects and spiders around the school grounds. Look for insect scars on leaves and trees, spider webs or egg sacs, decomposing matter where insects may have fed, woodpecker holes indicating where insects were eaten, spittle on a leaf or stem, and ant hills.



From the Project WILD Aquatic Guide, try "Are You Me?" This activity pairs the immature and adult stages of aquatic animals, including insects. In "Puddle Wonders," students observe insects that live in or visit puddles, like butterflies, wasps, and mosquitos. In "Water Canaries," students investigate samples of pond or stream water and identify aquatic insects and other organisms.

Sometimes nothing can beat direct observation and discovery. Students can study and graph fruit fly populations over a six week period while they learn math, or they can raise mealworms in jars in their desks to study life stages.

A big *thank you* goes to the following people for sharing the above ideas: Susan Scaffidi, Alberta Duke, Darlene Freiberg, Karen Syverson, Brian Saugstad, Jeff Barthen, Kevin Ryan, and the staff of the nature centers at Mosquito Hill and Havenwoods.

For more information about Project WILD research, contact: Susan Gilchrist, 608-221-6350.

WILD/PLT Resources

Materials

Available From the WILD/PLT Office:

Getting to Know Wildland Fire: A Teacher's Guide to Fire Ecology in the Northern Rocky Mountains. Ellen Petrick-Underwood. Nine classroom activities, designed for grades 4-8, cover topics such as conditions necessary for fire, fire fighting techniques, the role of fire in natural cycles and use of fire by American Indians. Limited copies are available.

Get the Drift! Cleaning Up Plastic Pollution for People and Wildlife. New from the national office, this supplementary set of resource materials is meant to accompany Project WILD activities that deal with plastic debris in marine, freshwater and land environments. Includes a 32 page teacher's guide and four posters. Limited number of packets available.

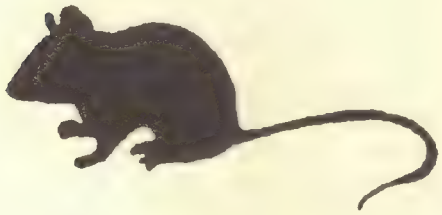
New activity adaptations:

Invent an Insect (from "Fashion a Fish," WILD Aquatic)

Migration Headache—Wisconsinized (from WILD Aquatic)

Tree Tales: Writing a Tree Biography (from "Tree Cookies," PLT Elementary)

Turkey Trouble—Wisconsinized (from WILD Secondary).



New correlations:

Campfire Activities to WILD

Girl Scout Activities to PLT

Merrill Science to PLT

Silver, Burdett and Ginn to WILD Elementary and Aquatic WILD

Silver, Burdett and Ginn to PLT

Scott Foresman and Co. Science Series to PLT

Scott Foresman and Co. Science Series to WILD and Aquatic WILD

Books:

Insect. Laurence Mound. 1990. Insect anatomy, species, and natural history in an appealing, thorough presentation suitable for browsing or close study. Grades 5 and up. Cost: $14.99. Publisher: Knopf, 400 Hahn Road, Westminster, MD 21157, 301-848-1900.

Insect Metamorphosis: From Egg to Adult. Ron Goor and Nancy Goor. Outstanding close-up photography and intriguing text carefully illustrate each stage of insect development. Numerous examples of interesting species help readers become skillful observers of insects in their natural habitats. Grades 3-6. Cost: $14.95. Publisher: Atheneum, Front and Brown Sts., Riverside, NJ 08370, 1-800-257-5755.

Spiders. Alice L. Hopf. 1990. Informative text and brilliant photographs describe shared characteristics and differences among a variety of interesting spiders found around the world. Includes discussions of webs, mating, motherhood and spider ingenuity. Grades 4-7. Cost: $13.95. Publisher: Cobblehill, 375 Hudson St., New York, NY 10014, 212-366-2000.

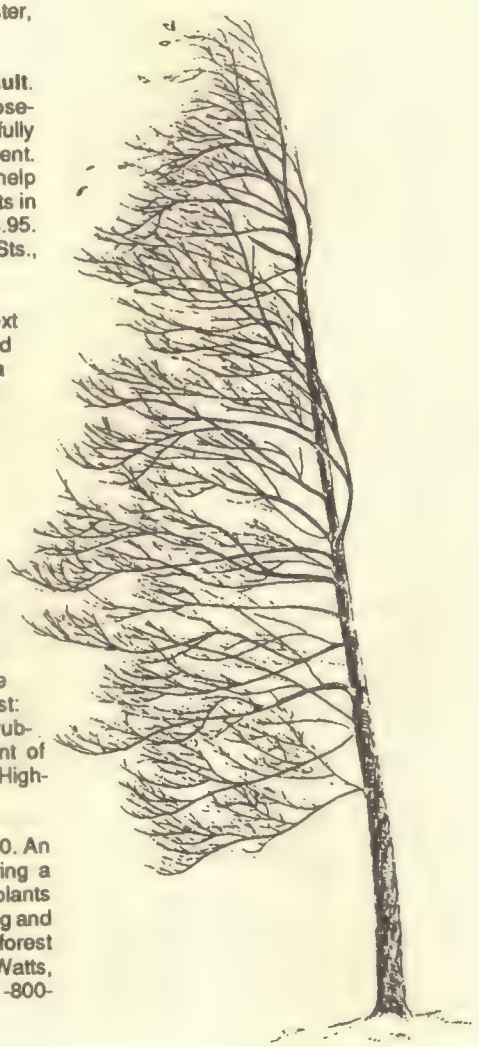
Forestry and Tree Education Catalog. California Department of Forestry and Fire Protection. A reference guide to books, pamphlets, audiovisuals and other educational materials. Materials are cataloged various ways and are sure to be helpful to anyone interested in trees. Cost: $26.50. Available from: The Forms and Publications Manager, California Department of General Services, P.O. Box 1015, North Highlands, CA 95660.

24 Hours in a Forest. Barrie Watts. 1990. An informative visual study of a forest during a summer day. An array of animals and plants emerge in early morning, daytime, evening and at night as readers follow the rhythms of forest life. Grades 4-6. Cost: $11.90. Publisher: Watts, 387 Park Ave. S., New York, NY 10016, 1-800-672-6672.

Life Cycles. Jennifer Coldrey and Jill Bailey. 1989. A series of 16 publications about the life cycles of a variety of plants and animals. Each book featuring a different organism contains information about reproductive and growth patterns as well as information about eating habits and natural enemies. Includes tips for collecting and keeping the organism for further study, or for observing the organism in its natural habitat. For grades K-4. Cost: $11.90. Publisher: Bookwright, 387 Park Ave. S., New York, NY 10016, 1-800-672-6672.

Skulls Unlimited. 1990. A catalog of animal skulls available for purchase. Contact: Skulls Unlimited, P.O. Box 6741, Moore, OK 73153, 405-632-4200.

Animal Camouflage: A Closer Look. Joyce Powzyk. 1990. Concealing coloration, disruptive coloration, disguise, mimicry, and masking are methods of animal camouflage exemplified and described in this book. For grades 3-8. Cost: $15.95. Publisher: Bradbury, Front and Brown Sts., Riverside, NJ 08370, 1-800-257-5755.

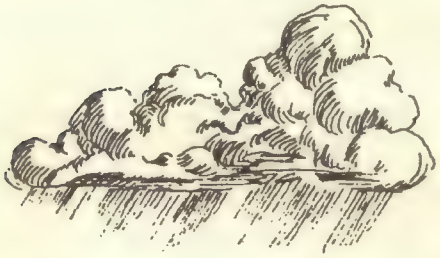


Bookshelf

The following list is a sampling of sky-related resources. This list is by no means complete. If you know of other resources helpful to you in your teaching, please let us know, so we can share them with others. Send the information to: Editor, *EE News*, DNR Education Programs, P.O. Box 7921, Madison, WI 53707.

Atmosphere

The Sky Observers Handbook. Charles E. Roth. 1986. A wonderful introduction to the sky, this guidebook includes tips, techniques and fascinating facts for the weatherwatcher, birder, amateur astronomer, aviation buff, naturalist and everyone who enjoys the outdoors. Cost: $11.95. Publisher: Prentice Hall Press, Simon and Schuster Building, Rockefeller Center, 1230 Avenue of the Americas, New York, NY 10020.



Clouds in a Glass of Beer: Simple Experiments in Atmospheric Physics. Craig F. Bohren. 1987. Explore the nature of rainbows, the color of the sea, the greenhouse effect, blue moons and more. This book presents more than 25 experiments that let you observe and reproduce natural phenomena with simple materials at home or in the classroom. Publisher: John Wiley and Sons, Inc., 605 Third Ave., New York, NY 10158-0012.

Night Sky

The Big Dipper. Franklyn M. Branley. 1991. Part of the highly successful "Let's-Read-and-Find-Out Science Book" series, this book for young readers introduces the Big Dipper as well as Ursa Major, Ursa Minor, and the North Star. Cost: $13.95. Publisher: HarperCollins, Inc., 10 East 53rd St., New York, NY 10022.

The Big Dipper and You. E.C. Krupp. 1989. This book invites children to hop in their spaceships and buckle up! The young reader will become absorbed in stories of the Big Dipper, the North Star, the Little Dipper and the coordinated illustrations. Cost: $13.95. Publisher: Morrow, 105 Madison Ave., New York, NY 10016.

Solar Energy

Hot Water and Warm Homes from Sunlight. Alan Gould. With help from this book, students build model houses and hot water heaters to discover more about solar power. For grades 4-8. Cost $7.50. Order from: National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009-1171.

Air Quality

1989 Air Quality Data Report. A summary of changes in Wisconsin's air quality over the recent past and description of specific activities of the Wisconsin DNR to monitor and control air pollution in the state. Available from: Wisconsin DNR, P.O. Box 7921, Madison, WI 53707. #Publ-AM-044 90.

Weather

Peterson First Guide to Clouds and Weather. John Day. 1991. Newest addition to the well known *Peterson First Guide* series, this simplified guide is excellent for the beginning naturalist. Cost: $4.95. Publisher: Houghton Mifflin Co., 2 Park St., Boston, MA 02108.

Weather Study Under a Newspaper Umbrella. H. Michael Mogil. This comprehensive guide integrates the newspaper throughout the curriculum. Appendices include hurricane tracking charts, cloud observation record sheets, degree-day worksheets, relative humidity-dew point tables, wind chill and humiture charts and a Moon Watch record sheet. For grades K-12. Cost: $32.95. Order from: National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009-1171.

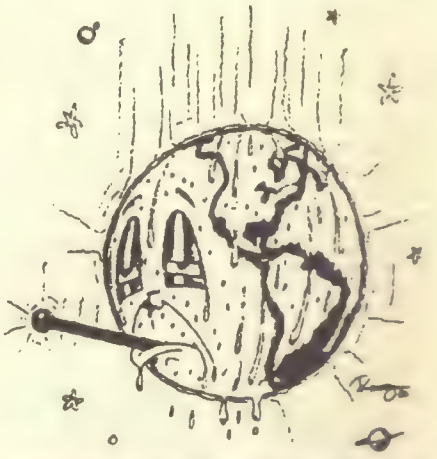
NatureScope: Wild About Weather. Part of the National Wildlife Federation's popular NatureScope series, this issue will help you introduce your students to weather. The activity guide includes weather-related activities, background information and craft ideas. Cost: $7.00. Available from: National Wildlife Federation, 1400 Sixteenth St. NW, Washington, D.C. 20036-2266.

The Cloud Charts. Developed by Weatherworks and the National Weather Association. Specifically designed for classroom use in grades K-9, three colorful posters introduce students to the wonder and reason behind clouds. Cost for set of three posters: $7.00. Order from: National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009-1171.

Global warming

CO2 Diet for a Greenhouse Planet. A "diet" describes steps to reduce global warming calories—the carbon dioxide and other greenhouse gas emissions associated with our lifestyles. Cost: $4.95. For the 80-page book plus a CO2 Diet Poster, send $6.00. Order from: National Audubon Society, 950 Third Ave., New York, NY 10022, 212-832-3200.

The Greenhouse Trap. This guide is designed to close the gap between what experts and the public know about this environmental issue. Offers a combination of facts and suggestions for public and personal action. Cost: $9.95, plus $3.00 shipping. Contact: World Resources Institute Publications, P.O. Box 4852, Hampden Sta., Baltimore, MD 21211, 301-338-6963.

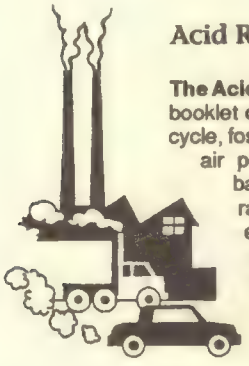


Dead Heat: The Race Against the Greenhouse Effect. Michael Oppenheimer and Robert H. Boyle. Presents political questions as well as environmental issues and deals with the scientific data (or lack of it) that makes the greenhouse issue so volatile. Covers factors that contribute to global warming and discusses alternate energy sources. Cost: $19.95. Publisher: Basic Book, Inc., 10 E. 53rd St., New York, NY 10022.

Global Warming. Laurence Pringle. 1990. An assessment of the greenhouse threat in an appealing format with thorough, up-to-date information on the causes and effects of temperature changes around the world. Includes a discussion of reducing greenhouse gasses. Cost: $14.95. Publisher: Arcade, Box 5365, Berkely, CA 97405.

Ozone depletion

Public Enemy 1,1,1. Many aerosol cans and other consumer products contain a little-known chemical that contributes to destruction of the ozone layer. This report lists 141 common household and office products containing the chemical, 1,1,1-trichloroethane, also known as methyl chloroform, and suggests actions consumers can take to encourage the development of environmentally sound alternatives. Cost: $6.00. Order from: Natural Resources Defense Council, 40 W. 20th St., New York, NY 10011.



Acid Rain

The Acid Rain Reader. This booklet discusses the water cycle, fossil fuel combustion, air pollution, acids and bases, pH scale, acid rain, aquatic and land ecosystems, food chains, and possible solutions to the acid rain problem. Cost: $5.95. Order from: The Acid Rain Foundation, 1410 Varsity Dr., Raleigh, NC 27606, 919-828-9443.

Global Issues

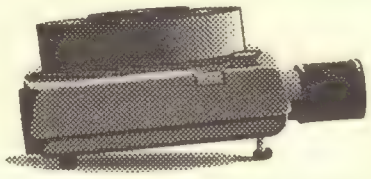
Global Environmental Issues: A Climatological Approach. David D. Kemp. Appropriate for science, geography and political science courses, this book takes a holistic approach to problems facing our planet. Includes information on desertification, acid rain, threats to the ozone layer and the greenhouse effect. Cost: $15.95. Publisher: Routledge, Chapman and Hall, Inc., 29 W. 35th St., New York, NY 10001-2291.

Great Explorations in Math and Science (GEMS) series. Activity guides for teaching about a variety of topics for preschool through 10th grade. Collection includes *Acid Rain, Global Warming, Earth, Moon and Stars, Hot Water and Warm Homes.* Brochures available from: GEMS, Lawrence Hall of Science, University of California, Berkely, CA 94720, 415-642-7771.

General

Cycles of Nature: An Introduction to Biological Rhythms. Andrew Ahlgren and Franz Halberg. This book brings the leading research in the rhythms of activity and life to middle and high school students. Teaches students how to recognize and measure common cycles found in nature. Cost $12.50. Order from: National Science Teachers Association, 1742 Connecticut Ave., NW, Washington, DC 20009-1171.

The Sense of Wonder. Rachel Carson. 1956. In this eloquent book, the author reaffirms her belief that those who live with the mysteries of earth, sea, and sky are never alone. Her narrative and the photography that accompany it chart the paths which adult and child can take together on the journey of discovering the joy, excitement, and mystery of the world we live in. Cost: $7.95. Publisher: Harper and Row, Publishers, 10 E 53rd St., New York, NY 10022.



Audiovisuals

The following three films are sampling of sky-related AV materials available from the Bureau of Audio Visual Instruction (BAVI), UW Extension, P.O. Box 2093, Madison, WI 53701-2093, 1-800-362-6888. Catalog available.

Stars Through the Seasons. (16 mm film) 14 min. Includes animation and slow motion to explain how your location, the time of day and date influence the position of visible stars. Illustrates seasonal changes in the stars resulting from the earth revolving around the sun. Rental: $10.00.

What Makes Clouds? (Video) 15 min. This entertaining exploration takes you on a sky tour to observe the different kinds of clouds and how they form. Laboratory experiments illustrate the process and create "bottled" clouds. Rental: $11.00.

Weather Systems in Motion. (Video) 15 min. This video clarifies the movement of air masses, compares cyclones and anticyclones and shows how waves in the upper atmosphere affect the development of warm and cold fronts. $9.00.

The following five videos may be purchased or rented from: Coronet/MTI Film and Video, 108 Wilmot Road, Deerfield, IL 60015, 1-800-621-2131. Rental price for each video is $75.00.

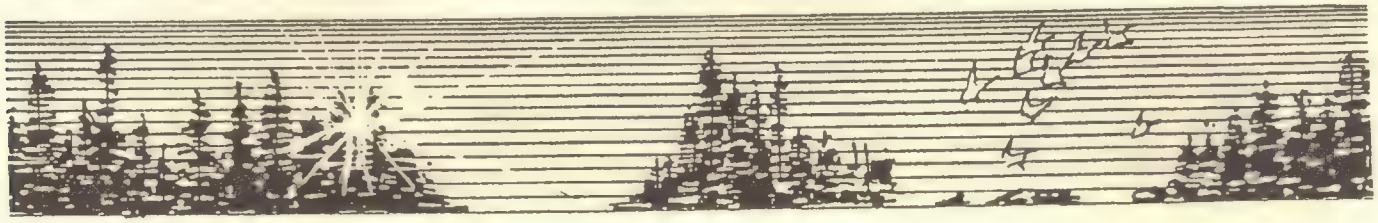
Breath of Fresh Air. 20 min. Clean air is essential to life, yet one fifth of the world's population breathe air that is hazardous to their health. This high school/college-level program explores various aspects of air pollution, from causes and consequences to possible solutions.

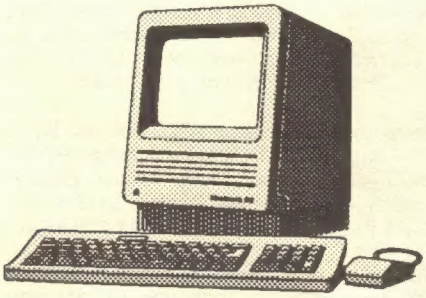
Pollution of the Upper and Lower Atmosphere. This film takes a look at fixtures in our world such as the internal combustion engine and jet aircraft, and analyzes the effects of these technologies on Earth's atmosphere.

Urban Impact on Weather and Climate. 16 min. Do cities experience more cloud cover than rural areas? This film answers that question and more. Revealing meteorological findings show weather and climate can be affected by the concentration of large buildings in urban environments.

Hot Enough For You? 58 min. Was the summer of 1988 a taste of things to come? This film from the NOVA Series looks at the greenhouse effect. Watch as scientists reveal the sources of "greenhouse gases" and point to a variety of ways to reverse this dangerous warming trend. High school level.

Can Polar Bears Tread Water? (The Changing Climate). This penetrating program investigates factors that influence the greenhouse effect. Recent disasters—famine, fire and flood—are examined as possible consequences of excessive amounts of CFCs, carbon dioxide, and methane gases. The dangers of rising sea levels and world-wide food shortages are also shown.





Software

Hothouse Planet. Cynthia Rosenzweig. A tutorial-based program that provides up-to-date factual information about the greenhouse effect with text and graphics. Six factors that affect warming can be varied to see the effects over time. Kit includes one diskette, one backup and teacher's guide. Cost: $70.00 for Apple, $72.00 for IBM. Order from: EME Corporation, Old Mill Plain Rd., P.O. Box 2805, Danbury, CT 06813-2805.

Weather Academy. In this simulation, students become "weather rookies" and alter various elements of the environment in order to produce specific weather conditions. Kit includes two disks, backups, student workbook and manual. Cost: $99.00. Available from: Focus Media, 839 Stewart Ave., Garden City, NY 11530.

PEMD Discovery Environmental Data Disc. Contains numerical data collected from reliable environmental agencies and placed in DataStacks—specially designed Hypercard stacks that allow for the easy selection of specific data from a large data bank. Included on the CD-ROM disk are U.S. temperatures and precipitations from 1918 through 1987, atmospheric ozone data, worldwide food, demographic, agricultural and general environmental data. Cost: $149.00. Available from: EDUCORP, 7434 Trade St., San Diego, CA 92121, 619-536-9999.

Calendar

September 13-15. *Becoming an Outdoors Woman.* An outdoor skills workshop co-sponsored by the Department of Natural Resources, UW-Stevens Point and the Wisconsin Sportswoman's Club. Primarily aimed at women, the workshop is open to all adults interested in learning a wide variety of outdoor skills. Registration fee: $100.00 (before September 1), includes sessions, lodging and meals. Contact: Jane Burroughs, Continuing Education and Extension, UW-Stevens Point, Stevens Point, WI 54481, 715-346-3717.

September 14 and 21. *Native American Perspectives in Science and Environmental Education.* Beaver Creek, Fall Creek. This workshop is designed to provide a new perspective on the way teachers and students can view the world. Participants will learn how to bridge the gap between Eurocentric scientific method and a holistic approach to interdisciplinary curriculum while having a rewarding and entertaining experience. Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

September 17 and September 24. *Project WILD Workshop.* Barron. 6 hour workshops for K-5 teachers. Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

September 20-22. *Autumn Harvest—Sense of Wonder Family Weekend.* Central Wisconsin Environmental Station, Amherst Junction. Rediscover your sense of wonder for nature and family through activities that celebrate the joys of the season. All family types invited. Registration fee: $60 (adults), $40 (ages 5-12), $25 (ages 1-4). Fee covers lodging, meals and program. Contact: Todd Knepfel, Central Wisconsin Environmental Station, 7290 County MM, Amherst Junction, WI 54407, 715-824-2428.

September 27-29. *Layman's Guide to Forestry Measurements.* Designed primarily for landowners, this workshop is also appropriate for science teachers and others interested in forest measurement techniques. Instructor: Bob Rogers, UW-Stevens Point. Contact: Corky McReynolds, Treehaven Field Station, 2540 Pickerel Creek Road, Tomahawk, WI 54487, 715-453-4106.

September 27-October 2. *NAAEE Annual Conference: Confronting Environmental Challenges in a Changing World.* St. Paul, MN. Rapid shifts in environmental, political, and social conditions pose a tremendous challenge for environmental educators. The North American Association for Environmental Education's 20th annual conference will confront these challenges, exploring the most successful, most innovative ways of educating for environmental action in this decade of change. Contact: NAAEE Conference Headquarters, Brukner Nature Center, 5995 Horseshoe Bend Rd., Troy, OH 45373.

September 27-29. *Life on the Upper Wisconsin.* Treehaven, Tomahawk. Explore wild and tamed stretches of the Upper Wisconsin River to learn about its natural and human inhabitants. Discover how can you use the river as a teaching resource. Instructors: Dan Sivek, Corky McReynolds, Sherry Klosiewski. Credit: 1-UWSP. Register by September 16. Contact: Dana Nelson, UWSP Continuing Education, Univ. of Wisc., Stevens Point; WI 54481, 715-346-3717.

September 28. *Wisconsin Flora and Fauna.* Spooner. Come learn about the bounty of educational opportunities awaiting you and your students outside your classroom window. You will learn about local field trip locations and how to identify "birds, bugs and flowers." Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

October 4-6. *Glacial Landscapes of North Central Wisconsin.* Through lectures, hikes and field trips, participants will learn about glacial theory and geologic landforms. Instructor: Dr. C. Milfred, UW-Stevens Point. Contact: Corky McReynolds, Treehaven Field Station, 2540 Pickerel Creek Road, Tomahawk, WI 54487, 715-453-4106.

October 8. *Project Learning Tree Workshop.* Spooner. A 6 hour workshop for K-5 teachers. Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

October 8-10. *Careers in Natural Resources.* Central Wisconsin Environmental Station, Amherst Junction. Observe natural resources professionals at work, participate in hands-on experiences, and explore career opportunities to share with your students. Instructor: Don Mortenson. Credit: 1-UWSP. Register by September 24. Contact: Dana Nelson, UWSP Continuing Education, Univ. of Wisc., Stevens Point, WI 54481, 715-346-3717.

October 10. *The Rain Forest Connection.* Madison Education Extension Programs, UW-Madison School of Education. This workshop will give teachers and others information and activities to make the connection between their students and tropical rain forests. Participants will receive a curriculum guide and other resource materials. Grades K-8. Instructors: Maryann Stephenson, Janet Peterson. DPI credit available. For information, contact: Linda Shriberg, Madison Education Extension Programs, 158 Education Bldg., Madison, WI 53706, 608-262-4477.

October 12 and 26. *Focus on Fall.* Environmental education techniques for teaching about fall. Schlitz Audubon Center, Milwaukee. Instructors: Don Quintenz and David Stokes. One credit available through UW-Milwaukee. Contact: Education Outreach, UW-Milwaukee School of Education, 578 Enderis Hall, P.O. Box 413, Milwaukee, WI 53201, 414-229-5255.

October 18 and 19. *Project WILD Workshop.* MacKenzie Environmental Center, Poynette. Contact: Bob Wallen, MacKenzie Environmental Center, W7303 County Hwy. CS, Poynette, WI 53955, 608-635-4498.

October 19-20. *Project WILD Workshop.* Bubolz Nature Preserve, Appleton. Contact: Lori Lee Smith, Bubolz Nature Preserve, 4815 N. Lynndale Dr., Appleton, WI 54914, 414-731-6041.

October 21. *Watershed World.* Beaver Creek. For teachers in grade levels 6-12, this workshop is designed as an introduction to a new integrated science program currently being developed. Computer software and data bases combined with aquatic field studies of local watersheds give students the opportunity to do scientific research on hydrology, water quality, and aquatic invertebrate populations. Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

October 23-26. *WAEE 1991 Fall Conference: Partnerships for the Earth.* Telemark Lodge, Cable. For description and details, see page 11-12.

November 1. *Tips and Tricks For Teaching Environmental Education.* Bjornson Education Recreation Site, Menomonie. Teachers of grades 4-6 can learn many new and innovative methodologies for environmental education. Instructor: David Schiotz. Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

November 2. *Teach Science With Plants and Soda Bottles.* Madison Education Extension Programs, UW-Madison School of Education. In this workshop, elementary and middle level teachers will learn how to perform experiments and how to demonstrate important biological processes with plants. Participants will discover ways to integrate science into art, social studies, language and math. Instructor: Gary Lake. DPI credit available. For information, contact: Linda Shriberg, Madison Education Extension Programs, 158 Education Bldg., Madison, WI 53706, 608-262-4477.

November 7. *Aquatic WILD Workshop.* Clark Electric, Greenwood. A 6 hour workshop for K-5 teachers. Contact: Vern Holm, CESA 11, Box 246, Elmwood, WI 54740, 715-639-4201.

November 9. *Project WILD/Aquatic WILD Workshop.* Ellwood H. May Environmental Park, Sheboygan. Contact: Terrie Cooper, Ellwood H. May Environmental Center, 3615 Muller Road, Sheboygan, WI 53083, 414-459-3906.

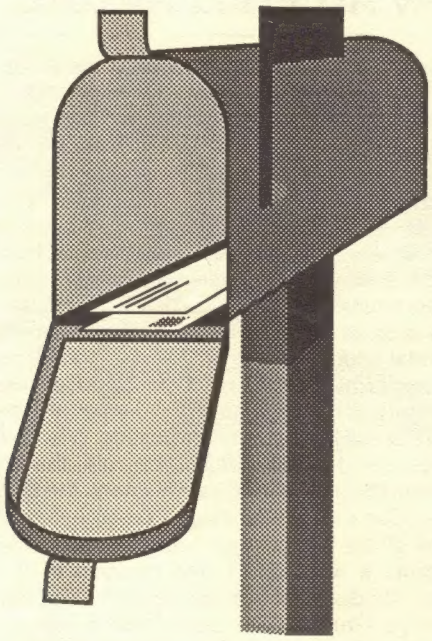
November 16. *Science in Literature.* Madison Education Extension Programs, UW-Madison School of Education. Learn how to use

storybooks and other "non-science" literature to teach science in your elementary or middle level classroom. Instructors will provide hands-on teaching tools and will demonstrate ways to adapt children's literature to inquiry-based, process science. Instructor: Gary Lake and Nancy Booth. DPI credit available. For information, contact: Linda Shriberg, Madison Education Extension Programs, 158 Education Bldg., Madison, WI 53706, 608-262-4477.

December 3. *Project Learning Tree Workshop.* Bethel Horizons, Dodgeville. Contact: Mark Breseman, Bethel Horizons, Rt. 1, Dodgeville, WI 53533, 608-935-5885.

December 17-January 18. *Costa Rica Tropical Ecology Study Tour.* Investigate the diverse ecosystems of Costa Rica—cloud forest, tropical dry forest, lowland rainforest, freshwater and marine environments—in this 23-day program. Cost: $2,475 (tentative), includes air fare from Chicago, room and most meals, on-site transportation and undergraduate tuition (3 credits). Graduate credit can be arranged at an additional cost. For more information, contact: Michael Gross, College of Natural Resources, UW-Stevens Point, Stevens Point, WI 54481, 715-346-2076.

January 24-26, 1992. *WAEE 1992 Winter Workshop: Harmony.* Treehaven, Tomahawk. The WAEE Winter Workshop is in its planning stages. If you'd like to be a presenter, or have any questions, contact: Kim Kaster, Bay Beach Wildlife Sanctuary, Sanctuary Rd., Green Bay, WI 54302, 414-391-3677.



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☛ We have several mailing lists from which addresses are drawn. Your name is on one (or more) of these lists. If you are a member of WAEE, you are on that mailing list. At this time *EE News* names cannot be removed from that list. We are also unable to delete names from the following lists: school principles, county foresters, DNR wildlife managers, foresters and fish managers, Project WILD and Learning Tree facilitators, and Wisconsin educational institutions.

If you have taken a Project WILD or Learning Tree workshop in Wisconsin, your name is on that mailing list. If you would prefer not to receive *EE News*, your name can be transferred to the "inactive" WILD/PLT file. Finally, many readers receive *EE News* because you requested to be added to the mailing list. If you no longer want to receive the newsletter, your name will be deleted from this list.

☛ Because of multiple mailing lists, some readers may receive duplicate copies of *EE News*. Duplicate copies may also result from slight differences in address or name. For example, "Diane Smith, 102 Clarkson," "Diane L. Smith, 102 Clarkson" and "Diane Smith, 102 Clarkson Apt. 1" might receive three copies of EE News...computers obviously have no idea that all these "Dianes" are the same person.

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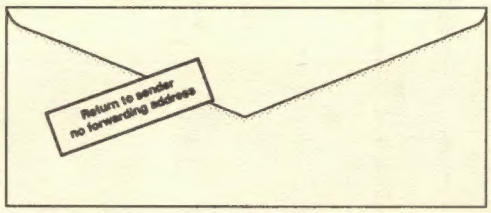

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☐ I would like to make a $5.00 donation to fund future *EE News* issues. Make checks payable to EE News, Wisconsin Department of Natural Resources. Thank You!

Return to: Editor, *EE News*, DNR Bureau of Information and Education, P.O. Box 7921, Madison, WI 53707 **by October 20, 1991.**

Editor, EE News
DNR Bureau of Information & Education
PO Box 7921
Madison, WI 53707

Wisconsin Programs Receive Renew America Awards

Wisconsin's Environmental Education Initiatives, a cooperative project of numerous Wisconsin agencies and organizations, and the Wisconsin Department of Natural Resources *Groundwater Study Guide and Environmental Education Program* received 1991 National Environmental Achievement Awards. The awards were presented in in Washington, DC in June by Renew America's *Searching for Success* program in partnership with the National Environmental Awards Council, a coalition of 28 leading environmental organizations. The Searching for Success Award program honors outstanding programs in 20 different environmental categories such as clean air, clean water, land stewardship and environmental education.

Wisconsin's Environmental Education Initiatives was chosen in the category of Institutional Environmental Education. Elements of WEEI that led to the award include: Wisconsin's environmental education teacher certification rule, the environmental education curriculum planning requirement, the DPI publication, "*A Guide to Curriculum Planning in Environmental Education*," the creation of the WI Environmental Education Board and the grant program it administers, the creation of the Center for Environmental Education at Stevens Point, and others.

The DNR's *Groundwater Study Guide* was chosen in the category of groudwater protection. Using the *Groundwater Study Guide and Environmental Education Program*, middle-school teachers help students gain an appreciation for the importance of water conservation. The guide is designed to be "ready to use." It provides activities and materials such as copy masters, worksheets and the DNR's "Groundwater in the Water Cycle" poster. Activities demonstrate concepts of the water cycle, wastewater treatment, groundwater pollution and hydrogeology. By educating youth about the importance of groundwater and how to protect it, this program is helping to assure that future generations will have a safe, stable source of water.

The *Groundwater Study Guide* and *Wisconsin Environmental Initiatives* are listed in *The Environmental Success Index*. This one-of-a-kind directory provides a broad range of more than 1200 creative and effective environmental programs from every state in the country. Single copies are available for $25.00. For further information on Renew America or to order copies of *The Environmental Success Index*, contact: Renew America, 1400 16th St., NW, Suite 710, Washington, DC 20036, 212-232-2252.

The *Groundwater Study Guide* may be ordered from:

Wisconsin Department of Administration
Printing and Publications Section
Document Sales and Distribution Unit
P.O. Box 7840
Madison, WI 53707-7840

All orders must be prepaid, $10.00 + $.50 tax (if applicable), unless you're on the State's general billing system. If on the billing system, be sure to include your customer use code when placing your order.

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